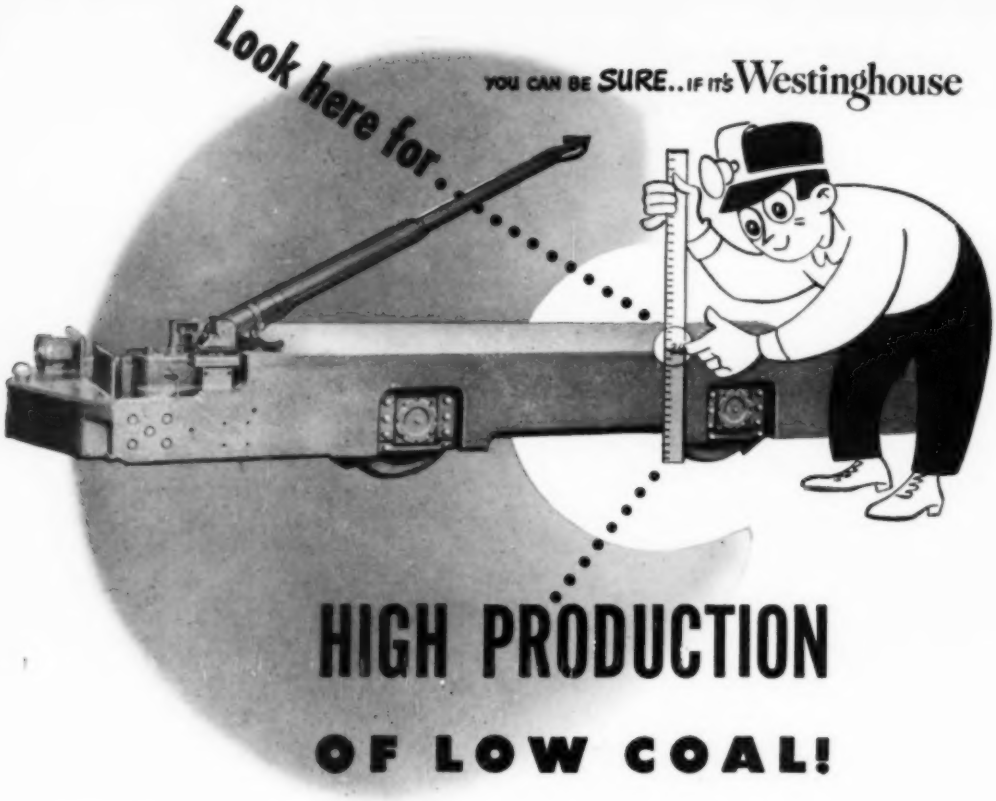
Coal Age

THE WELFARE FUND... p. 70

YOU CAN BE SURE.. IF IT'S Westinghouse



HIGH PRODUCTION OF LOW COAL!

The 15-Ton Low Liner.. *26 inches low*

. . . a ***standard*** Westinghouse mine locomotive designed and built to meet the ***special*** requirements for mining low seam coal.

The low height and excellent clearance allows this versatile locomotive to operate in seams of thickness formerly limited to gathering locomotives. It's your answer to the increasing demand for getting out every possible ton of coal . . . efficiently and economically.

Although *The Low Liner* can be built 26 inches low, all important standard details of design and construction have been maintained: flush-frame construction for safety and ample equipment space; roller journal bearings with boxes removable without untrucking; leaf springs for smoother riding; cross equalization for better tracking; electro-pneumatic control for positive operation.

Consult your Westinghouse office or write for B-3702, "The Low Liner", Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-15129

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES

Mine Locomotives

Rubber muscles for jaws that chew rocks

A typical example of B. F. Goodrich product improvement

BY THE TIME it reaches the end of that roller coaster, a rock has become sand. Each climb carries it to a crusher that reduces its size—from big ones into little ones.

But the chains that drove that whole mass of equipment were always wearing out, and breaking. They had to be greased of course; the grease collected dust; the dust cut the chains. And when that mass of machinery stopped, costs mounted by the minute.

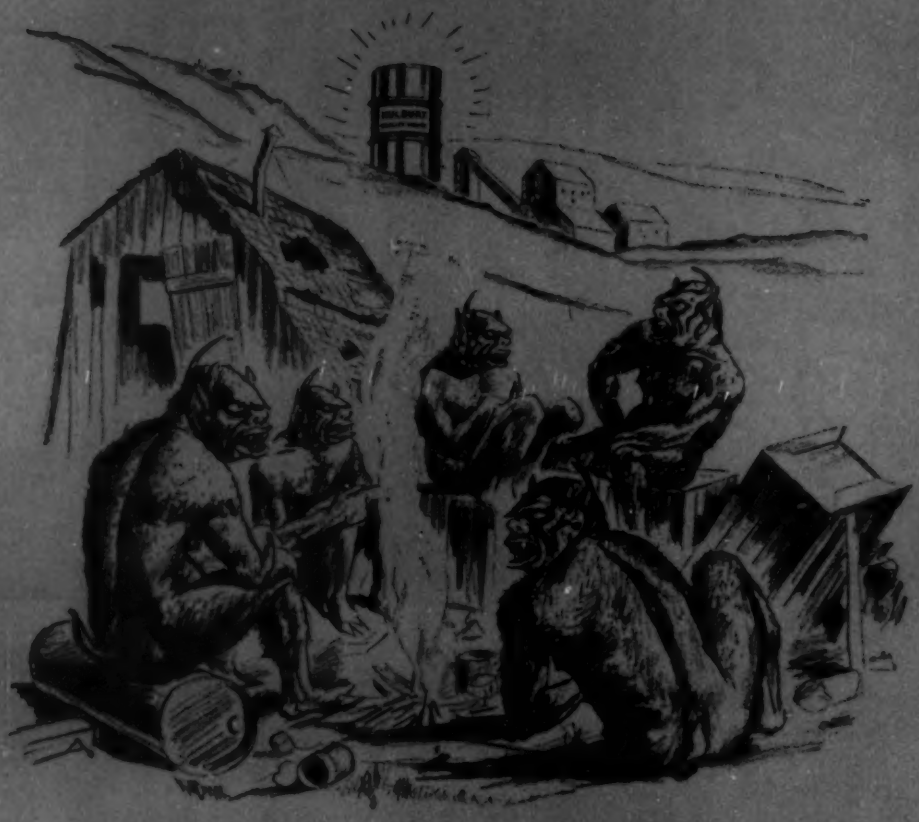
Rubber V belts were proposed, but the terrific loads would have stretched them into useless shape in no time. Just about then B. F. Goodrich developed a new kind of V belt—much stronger than other belts because of a new kind of reinforcement called a "grommet".

A B. F. Goodrich distributor suggested that the quarry owner replace the noisy, hard-to-maintain chain drives with these grommet belts. They were installed 7 years ago, have already lasted four times as long as the old-type drives, and are still going strong. They're clean and quiet—no grease or dirt, no clanking.

Improving products long considered "standard" is day-by-day work for B. F. Goodrich engineers. Every one of the thousands of BFG products is subject to continual research and experiment to improve the product or develop useful new applications of rubber for industry. Thousands of business men come to B. F. Goodrich first, sure that BFG has or will find the answer to their problems. *The B. F. Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

B.F.Goodrich
RUBBER FOR INDUSTRY

A *Permanent* VACATION



When Hulburt Quality Grease comes into your mine —FRICTION DEVILS ARE TOSSED OUT AND STAY OUT. And YOU too get a permanent vacation from trouble, delays and breakdown and repairs of coal mining machinery due to faulty lubrication.

HULBURT OIL & GREASE COMPANY, PHILADELPHIA, PA.

Specialists in Coal Mine Lubrication

for FRICTION DEVILS!

Lay 'em off with

Hulburt Quality GREASE

Yes—take FRICTION DEVILS permanently off your payroll the Hulburt way. Use the QUALITY Grease that's made to do one job and do it supremely well. And use the services of Hulburt Engineers, who will go down into your mine and make suggestions and recommendations that will show you better ways to better lubrication with Hulburt Quality Grease.

users of HAZACORD REEL CABLE
benefit from
HAZAPRENE ZBF * SHEATH

Tough Hazacord Reel Cable now protected with this new Hazard Sheath that provides still greater safety, economy and efficiency in electric locomotive cable service

No other mining operation proves Hazacord's *ability to "take it"* better than the outstanding *service it gives* on mine locomotives. Here, as you well know, every potential enemy of long, safe cable life is encountered continuously. And today, Hazacord Reel Cable is an even better buy with the added Hazard development — the Hazaprene ZBF Sheath.

This sheath, through mold curing, takes on the density and toughness required to prevent tears or breaks . . . has a smooth surface that slides readily over sharp edges. Yet the flexibility of Hazaprene is ample to withstand the "ins and outs" of reeling. It's compounded with neoprene, to resist oils, chemicals, acid mine water, etc. The unusual flame-resistance of Hazaprene ZBF is fully explained in box at right.

* ZBF ZINC BORATE FORMULA

Flame tests have shown that Zinc Borate imparts greatly increased fire-resistant properties to neoprene compounds with burning rates reduced by as much as 20% and weight losses by as much as 40%. Afterglow is materially reduced also. Millions of feet of cable protected by this type of sheath were used during the war by the Navy for special operating conditions to gain extra fire protection. Hazaprene ZBF Sheaths mean not only greater safety because of unusual flame-resistance and lack of afterglow — but also longer life through increased resistance to abrasion, wear and tear.

The engineering of Hazacord Reel cable includes such advantages as heat-resisting insulation that takes current surges without damaging effects . . . and conductor, insulation and sheath are firmly bonded so there's no slipping or bunching as the cable is paid out and reeled in.

Make your next reel cable Hazacord, and then compare its long, safe service with your present standards. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

HAZARD

7343

insulated wires and cables for every mining use

Coal Age

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You don't lead in sales for 17 years unless you lead in value!

International Trucks have led in heavy-duty truck sales for 17 straight years!

WHAT HEAVY-DUTY TRUCKS offer the biggest value? The most exacting truck buyers in America have answered that one.

You can find their answer by looking at registration figures for new trucks with gross weight ratings of 16,001 pounds or over.

Those figures show that International Trucks have been *America's largest-selling heavy-duty trucks for 17 straight years!*

A heavy-duty truck is a major investment. You can bet your bottom dollar that the men who buy them don't give any line of trucks a vote of confidence like they've given International unless their profit and loss statements show them that it pays.

But don't think that International Trucks offer outstanding value in the heavy-duty field *alone*. There are 22 models of International Trucks plus 1000 different specialized variations to meet individual hauling requirements. Gross vehicle weight ratings range from 4,400 to 90,000 pounds.

Trucks built to meet your specifications—No matter what model International Truck you buy, you get the basic values that have made International Trucks the largest-selling heavy-duty trucks in America for the past 17 years.

You get a rugged truck unweakened by a single compromise with passenger car design.

You get a long-lasting truck. *More than half of all the Internationals built in the last 42 years are still on the job.*

You get a truck specialized to meet your particular specifications; specified by a truck sales engineer who knows your business in terms of the demands it makes on trucks.

See your International Truck dealer or branch.

International Harvester Builds
McCormick Farm Equipment and Farmall Tractors
Motor Trucks and Industrial Power
Refrigerators and Freezers

INTERNATIONAL TRUCKS

INTERNATIONAL HARVESTER COMPANY • CHICAGO

FIRST IN HEAVY-DUTY TRUCK SALES FOR 17 STRAIGHT YEARS

NO LONGER A "PROBLEM CHILD"

Many operators shied away from cleaning their fine coal because of the difficult drying problem. Now, they've found the answer to that problem in the Bird Coal Filter.

The BIRD came along at the right time. It does the toughest part of the job — gets the water away from the fine coal.

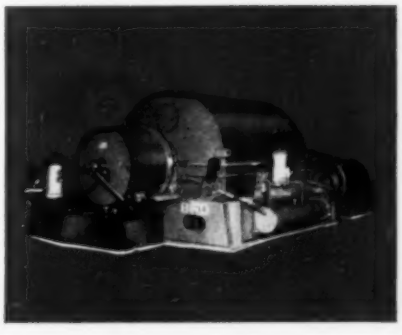
Today, thousands of tons of coal are being dried by the BIRD every 24 hours. It accepts the fine coal from any washing process, gets it as dry as can be obtained by any other combination of equipment, delivers it well blended and ready for direct loading or for feed to thermal dryers.

The BIRD gets the water so clean a closed circuit is permitted.

It runs for months without a shutdown for maintenance.

The BIRD is available in a number of sizes, the larger handling 40 to 60 tons of coal per hour.

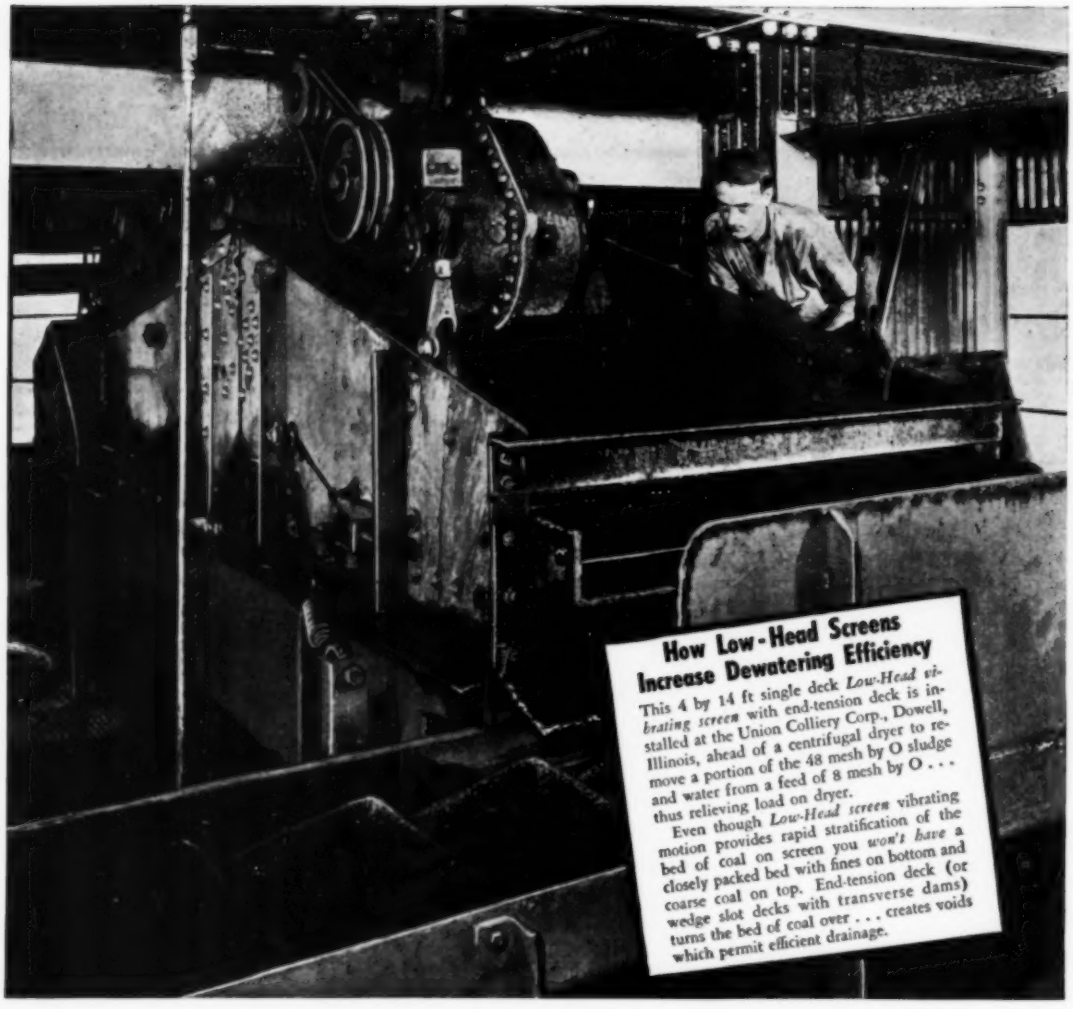
Write for new Bulletin containing complete information.



BIRD MACHINE COMPANY
SOUTH WALPOLE, MASS.

The BIRD Continuous Centrifugal COAL FILTER

How to Cut Dewatering Costs...



How Low-Head Screens Increase Dewatering Efficiency

This 4 by 14 ft single deck *Low-Head vibrating screen* with end-tension deck is installed at the Union Colliery Corp., Dowell, Illinois, ahead of a centrifugal dryer to remove a portion of the 48 mesh by O sludge and water from a feed of 8 mesh by O . . . thus relieving load on dryer.

Even though *Low-Head screen* vibrating motion provides rapid stratification of the bed of coal on screen you *won't have* a closely packed bed with fines on bottom and coarse coal on top. End-tension deck (or wedge slot decks with transverse dams) turns the bed of coal over . . . creates voids which permit efficient drainage.

AND GET INCREASED CAPACITY, TOO — WITH LOW-HEAD DEWATERING SCREENS!

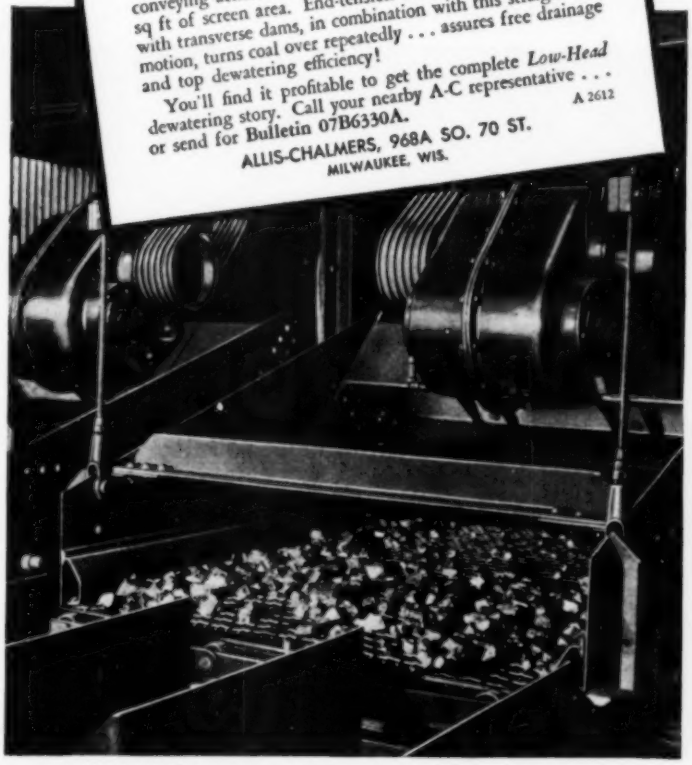
SPECIFY *LOW-HEAD vibrating screens* with reverse end-tension deck for sludge screening and dewatering small coal. For dewatering large coal and for pre-wetting ahead of heavy density units specify *Low-Head screens* with side tension deck.

Here's why: The *Low-Head screen* operates horizontally — saves headroom . . . saves installation costs. Straight-line vibrating motion at 45° to the horizontal results in a definite conveying action and in maximum dewatering capacity per sq ft of screen area. End-tension deck, or wedge slot deck with transverse dams, in combination with this straight-line motion, turns coal over repeatedly . . . assures free drainage and top dewatering efficiency!

You'll find it profitable to get the complete *Low-Head* dewatering story. Call your nearby A-C representative . . . or send for Bulletin 07B6330A.

A 2612

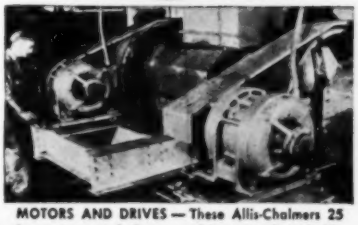
ALLIS-CHALMERS, 968A SO. 70 ST.
MILWAUKEE, WIS.



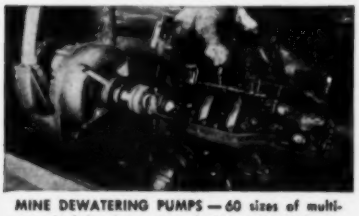
LOW-HEAD SCREENS are also used for wet or dry sizing. They combine high strength and light weight. Welded parts are "stress-relieved" to eliminate strain around welds. Support frames are designed to provide long screen surface life. Sizes 3 by 6 to 6 by 16 ft.

Low-Head, Vari-Pitch, Texrope are Allis-Chalmers trademarks

OTHER COST-CUTTING TONNAGE-INCREASING PRODUCTS FOR COAL



MOTORS AND DRIVES — These Allis-Chalmers 25 hp motors and Texrope drives supply reliable power for stoker coal crushers in coal cleaning plant. Complete Allis-Chalmers motor line, 1 hp and up, includes explosion-proof motors approved for Class I-D or 2-G locations. Bulletin B6052H.



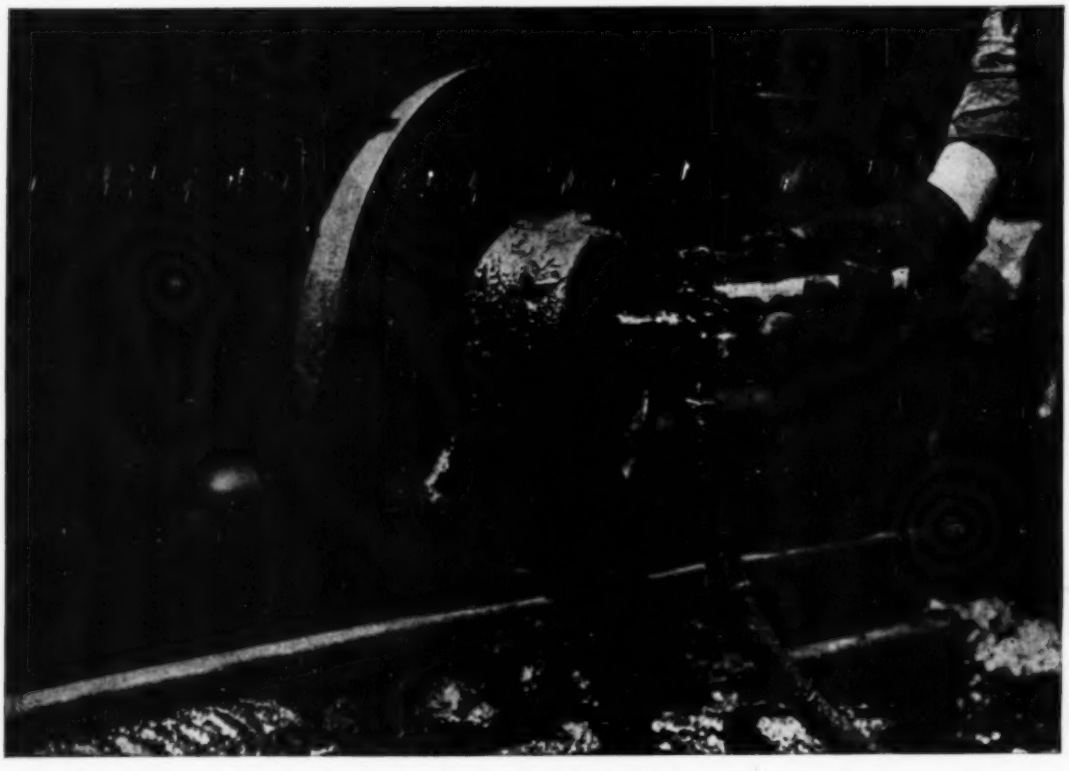
MINE DEWATERING PUMPS — 60 sizes of multi-stage high head pumps are built by Allis-Chalmers, with heads to 2,000 ft; capacities to 10,000 gpm; 2 to 7 stages. Above is two stage pump rated 150 gpm; 800 ft head; 3,500 rpm, used in mine dewatering service. Can be serviced without disturbing piping.

VARI-PITCH SPEED CHANGER on conveyor drive provides 300 to 375 percent speed change with the turn of a hand wheel. Two wide-range, worm adjusted sheaves are combined in a compact, enclosed unit. Adjustable to fractions of a revolution. Send for Bulletin 20B6013C

ALLIS-CHALMERS

. . . Builds for Coal Progress!

Look forward to *easier*



TEXACO

TEXACO LUBRICANTS

starts this winter

Assure uninterrupted operation, greater economy by lubricating mine car wheels with Texaco Olympian Grease

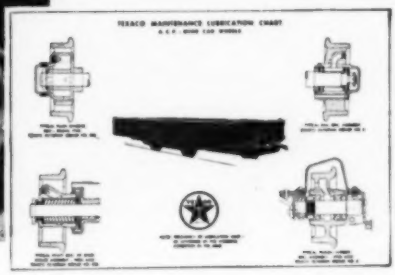
To be sure your trains start and roll as easily in January as in August, lubricate car wheel bearings with *Texaco Olympian Grease*. It's a lubricant that is little affected by temperature changes . . . assures smooth, easy operation when the mercury dives, stays in the bearings when it climbs.

Texaco Olympian Grease is made in three consistencies to meet all requirements. Use it in plain, cavity-hub or anti-friction bearings. It resists oxidation and separation, seals out dirt and moisture, assures longer bearing life and lower maintenance costs.

In hydraulic mechanisms, *Texaco Regal Oils (R & O)* assure protection against sludge, rust and foam. They keep systems clean, guard pumps against wear, help you avoid costly stoppages.

Throughout your mine, effective lubrication — *Texaco* — can raise efficiency and lower costs. Let a Texaco Lubrication Engineer assist you. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write:

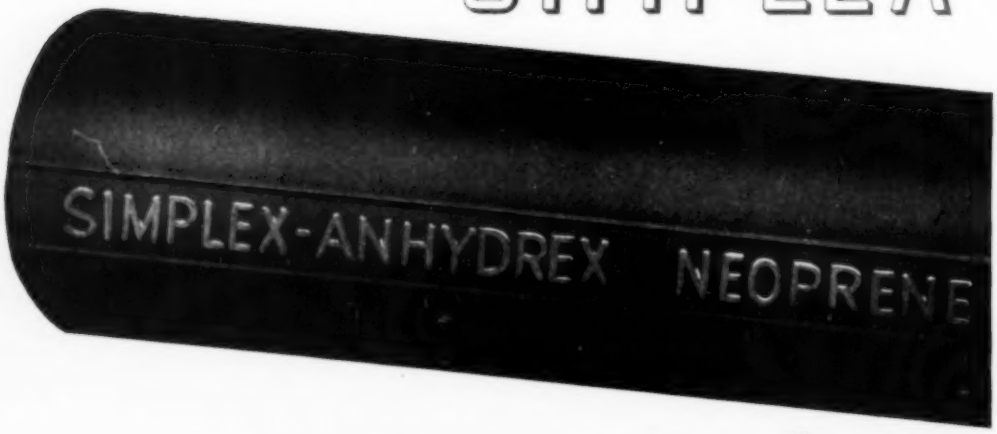
The Texas Company, *National Sales Division*, Dept. C, 135 East 42nd Street, New York 17, New York.



TEXACO MAINTENANCE LUBRICATION CHARTS: Leading manufacturers of underground coal mining machinery approve Texaco lubricants for use on cutters, loaders, locomotives, etc., and have cooperated in preparing these charts. Charts show clearly where and when to use the proper Texaco lubricant. Order the charts you need by make and model of each machine.

For the Coal Mining Industry

SIMPLEX-



. . . a great new insulation perfected in the

The Simplex Laboratories have again contributed a remarkable development in the field of rubber chemistry. They have perfected a new rubber insulation. It is the only insulation to combine high temperature resistance, long life and ozone resistance with extremely high electrical stability when exposed to water for extended periods of time. No other insulation combines all these four properties in the same remarkable degree possessed by Simplex-Anhydrex XX insulation. This insulation is truly a remarkable demonstration of the value of the Simplex Research Laboratories as they affect your wire and cable problems.

Simplex-Anhydrex XX has High Heat Resistance

This great new insulation has extremely high heat resistance. Simplex guarantees that Simplex-Anhydrex XX insulation will operate at 176° F. (80° C.) in dry locations up to and including 8,000 volts, and 167° F. (75° C.) under all other conditions of installation and operating voltages. This means increased current loads for cables insulated with Simplex-Anhydrex XX and less chances of failure at times of inevitable overloads than can be safely expected with any other type of high voltage rubber insulation.

Simplex-Anhydrex XX has Great Ozone Resistance

Simplex-Anhydrex XX is, to all intents, inert to the action of ozone, oxidizing agents and sunlight. An 0.010 to 0.015% concentration of ozone by volume is considered a severe test for new, unaged rubber compounds to withstand for only three hours. Yet even after being aged in an air oven for 7 days at 250° F., Simplex-Anhydrex XX insulation will withstand 0.03% concentration for hours and hours. It can safely be said that Simplex-Anhydrex XX

ANHYDREX XX

Simplex Laboratories

insulation is practically invulnerable to the attacks of ozone, sunlight and other oxidizing agents. It has, therefore, an extremely long service life.

Simplex-Anhydrex XX has Remarkable Moisture Resistance

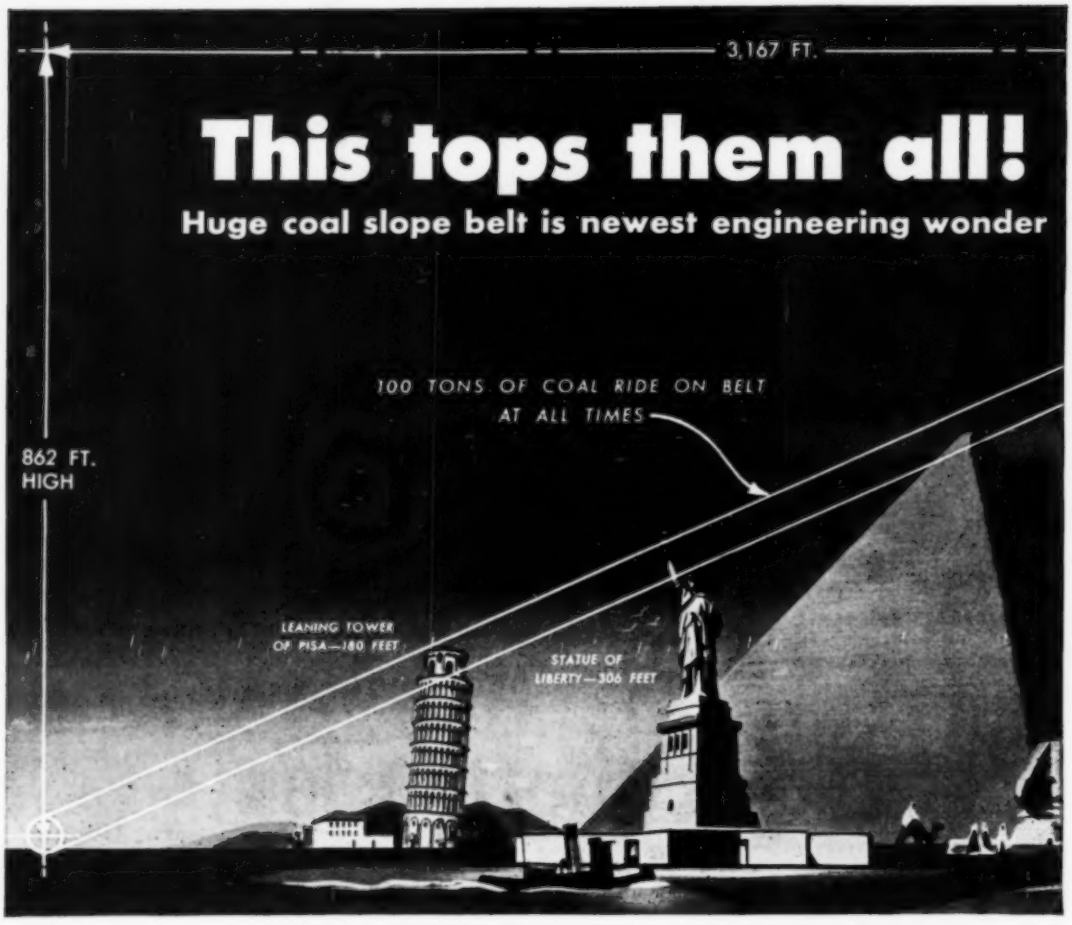
Any cable which is put underground, either in ducts or otherwise, needs high resistance to water absorption. Simplex-Anhydrex XX has this resistance to a truly remarkable degree. We will guarantee that the maximum water absorption of Simplex-Anhydrex XX, after the severe aging test of 7 days in air oven at 250° F. (121° C.), will not exceed 15 milligrams per square inch of exposed surface when immersed in distilled water at 70° C. for 7 days.

We will gladly send you further information without obligation, of course, if you will send your inquiry to the address below.

Simplex

WIRES & CABLES

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.


3,167 FT.
This tops them all!
Huge coal slope belt is newest engineering wonder
100 TONS OF COAL RIDE ON BELT AT ALL TIMES
862 FT. HIGH
LEANING TOWER OF PISA—180 FEET
STATUE OF LIBERTY—306 FEET

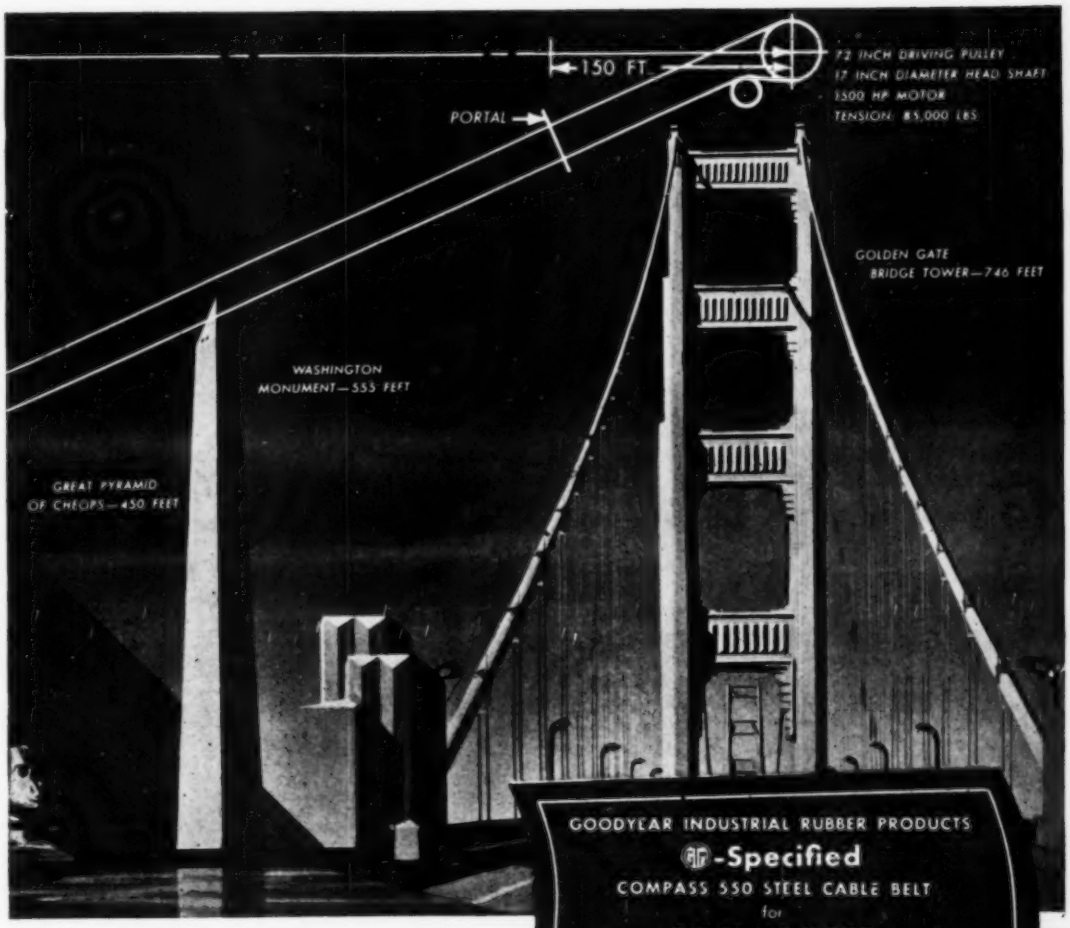
The monumental structures shown above—each the tallest of its kind—are all eclipsed in height by the newest single-flight slope belt engineered by the G.T.M.—Goodyear Technical Man. *It is the highest and longest single-flight slope conveyor in mining history!* This new belt, to be installed in an Illinois mine, has a monumental lift of 862 feet—*18% higher than the present world's record belt*—another Goodyear installation. And the horizontal distance from head pulley to tail is 3,167 feet—making it the longest slope flight yet.

This record-breaking belt will meet these requirements: deliver 1,200 tons of coal per hour at the tipple—carry 20 tons per minute. It takes 6,800 feet of belting, 42 inches wide and weighing 174,000 pounds, to do the job. Maximum belt tension at the driving pulley is 85,000 pounds.

The belt assigned to this world-beating task is Goodyear's COMPASS 550 Steel Cable—specified by the G.T.M. because of its proved high-load capacity. The COMPASS construction "muscles" the load-carrying section of the belt with wiry, high-tensile steel cables. They give the belt unparalleled strength without the bulk and stiffness unavoidable in conventional plied-up construction. Moreover, the COMPASS belt construction gives it high dimensional stability that reduces stretch under severe loads over long periods to less than 1%.

Bigger belts coming! Including this installation, Goodyear has now belted 12 of the 14 highest lifts—striking proof of Goodyear superiority in slope-conveyor engineering. But even these records will fall. For Goodyear's COMPASS construction makes possible single-belt lifts as high as 1,500 feet.

Mine-proved Compass steel cable belts have already carried millions of tons of coal and ore in several years of mine service. Standard COAL-FLO—for average-distance hauls below ground—and rayon COAL-FLO—for longer distances—have been equally successful. To realize the full economies of slope-belt haulage, consult the G.T.M. first. Write Goodyear, Akron 16, Ohio.



GOODYEAR INDUSTRIAL RUBBER PRODUCTS

GT-Specified

COMPASS 550 STEEL CABLE BELT

for

SLOPE HAULAGE

Heavy duty abrasion resistant rubber cover

Single plane of steel cable load carriers. All cables flex around pulleys on same axis and are protected from external injury and corrosion by thick sheath of rubber

Two ply fabric envelope

High quality fabric breaker

Why single-flight belts outperform multiple-flight conveyors

Eliminate nuisance and hazards of transfers in the slope

Do away with offset slopes—material flows uninterruptedly from mine level to tipple

Greater life-expectancy compared with short, multiple-belt flights

RESULT: lower operating cost and more profitable output

FOR HOSE, FLAT BELTS, V-BELTS, MOLDED GOODS, PACKING, TANK LINING built to the world's highest standard of quality, phone your nearest Goodyear Industrial Rubber Products Distributor.

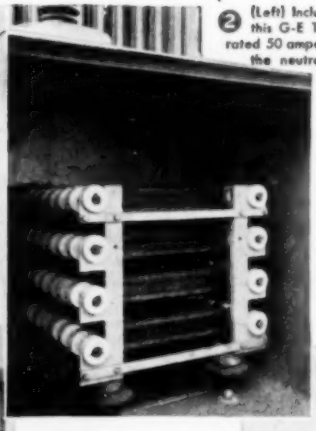
Compass, Cost Plus—T. M.'s The Goodyear Tire & Rubber Company

GOODYEAR

THE GREATEST NAME IN RUBBER

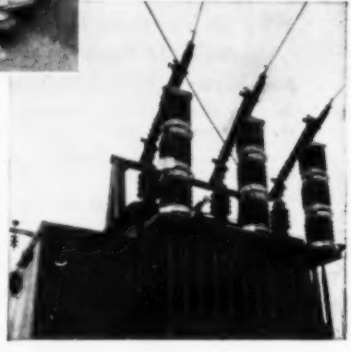
"We're sold on it!"

"THAT'S WHY WE'RE INSTALLING THE SAME SETUP IN ANOTHER STRIP MINE."



❷ (Left) Included in the unit substation is this G-E Type EW grounding resistor, rated 50 amperes continuous, for grounding the neutral of a 4160-volt circuit. It eliminates the hazard of high-voltage shocks resulting from undetected shorts.

❸ (Below) Installed on the 33 kv incoming line of the unit substation, these 3 sets of G-E Thyrite station-type lightning arresters are each rated 34.5 kv. Compact and of simple design, these G-E arresters have a record of excellent protective efficiency in preventing system disturbances or outages.



❶ (Left) Here is the Harmattan Mine's G-E outdoor-type, skid-mounted unit substation, rated 1500 kva, which steps down incoming power from 33,000 to 4160 volts. Because the G-E power distribution system keeps the voltage drop to a minimum, the equipment can operate farther from the substation, thus resulting in less frequent moving of the substation.

GENERAL ELECTRIC

942-5

Complete General Electric power distribution system helps minimize shutdowns, reduces delays and accidents, cuts costs, says Mr. L. E. Briscoe, Electrical Engineer of Fairview Collieries.

At the new coal-stripping operation of the Fairview Collieries Corporation at the Harmattan Mine near Danville, Illinois, a complete, co-ordinated General Electric power distribution system was recently installed, comprising unit substation, cable, and cable-skid switch houses. As a result, according to Mr. L. E. Briscoe, electrical engineer in charge, "We are *sold* on this type of power distribution system and are installing the same setup in another strip mine that we are modernizing."

Let Mr. Briscoe explain why:

"A dependable power distribution system," he says, "helps keep shutdowns to a minimum, which is the key to successful dragline operation. By using cables instead of overhead lines, power lines can be kept out of the way and advance with the operating equipment. This eliminates many accidents and delays, and provides big savings in money.

"The flexibility of our G-E system is due to (1) use of standardized equipment, (2) use of polarized couplers which permits interchanging cables, and (3) the ease and speed with which the cables can be interchanged.

"The G-E power distribution system also provides for testing ground continuity of each 4160-volt incoming and outgoing cable on the hill-type cable skids. This assures that the ground protection system is always working, does away with testing the cables by bells or other methods, and saves us valuable time."

Advantages such as these—plus additional savings in power costs and relocating time and costs—can be yours with a completely integrated G-E power distribution "package." It's worth your while to check the facts with a G-E mining specialist. Call him—today. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

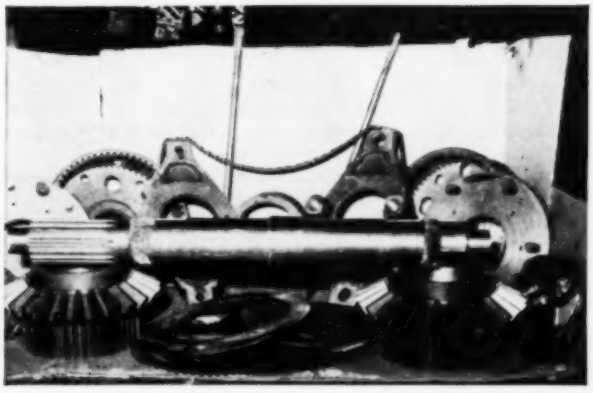
4 (Above) The Harmattan Mine uses 9 of these G-E portable, cable-skid switch houses to serve its surface mining equipment. They provide maximum portability and convenience plus more selective tripping. For safety, the G-E system is designed to have at least two protective breakers between each piece of operating equipment and the unit substation.

5 (Below) This interior view of one of Harmattan's hill-type cable-skid switch houses shows the power circuit breakers, rated 25,000 kva interrupting capacity, 3 phase, 60 cycle, 5 kv maximum; together with a 6-volt battery and a G-E Type SB-1 switch for testing ground continuity.

6 (Above) G-E cable-skid switch houses are metal-enclosed and sturdily built to provide maximum service continuity under conditions such as shown here. At Harmattan, G-E portable cable—all of the same type for easy interchangeability—is used exclusively.

Power Distribution Systems
—to cut mining costs per ton!

LESS clutch maintenance



MORE loader output...

CLUTCH repair costs down 50% ... no delays for "warming up" loaders ... easier and faster loading ... these benefits have been brought to midwest mines by Superla Mine Lubricants. Here's why these products will assure similar benefits for you.

Superla Mine Lubricants keep transmission cases clean. *Clutches operate easily with no gumming or coking caused by oil deposits.* When machines are started, these lubricants flow readily between clutch plates, protect them against wear, eliminate "clutch drag" and the necessity for warming up loaders. During long periods of continuous operation, Superla Mine Lubricants do not thin out excessively, provide safer lubrication for clutch plates.

A test of Superla Mine Lubricants will prove their ability to keep your loaders on the job longer with less maintenance. These products are available in oil and grease grades suitable for any type of cutter or loader. A Standard Oil Lubrication Engineer will gladly help you select the proper grades for your equipment.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA)

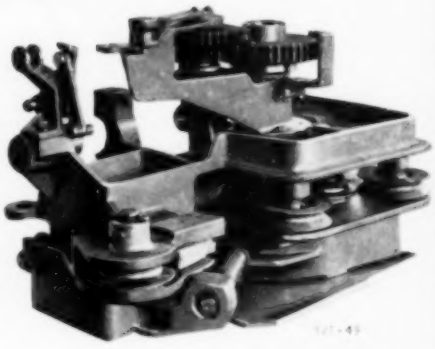
Superla
Mine Lubricants

STANDARD OIL COMPANY (INDIANA)

STANDARD

SLACK HANDLING DEVICE . . .

Jeffrey 35-B or 35-BB SHORTWALL Machines can now be equipped with a Slack Handling Device, a packaged unit (right) which can be readily applied to machines in the field.



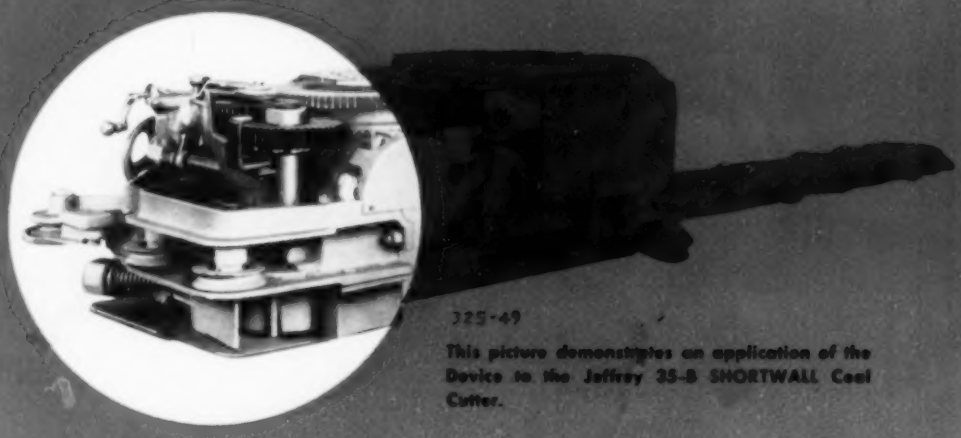
Simple to apply . . . original gearing is utilized . . . no changes necessary to top plate and rollers. Original bottom pan extension is removed . . . device bolted on. Few moving parts . . . easily accessible for maintenance.

Here you see the Slack Handling Device all wrapped up in a neat package and ready to go to work for you.

70% to 85% of the cuttings removed from kerf . . . no cleaning necessary before firing shots. Cleaner kerf — less powder — better sized coal. Shoveling slack eliminated . . . slack is pushed under slack pile—not thrown. Coal dust reduced to minimum—as is explosion hazard.

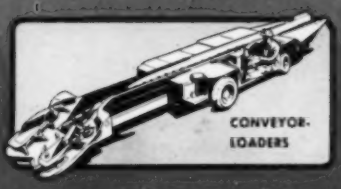
Study the accompanying views . . . they show the Device as a unit, as part of the machine and doing a neat job of cleaning kerf in a mine. The drawing on next page illustrates flow of slack.

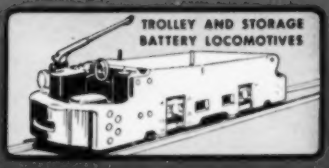
FOR JEFFREY SHORTWALLS

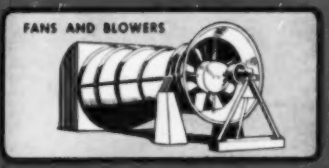


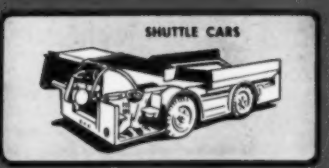
325-49

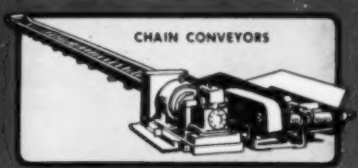
This picture demonstrates an application of the Device to the Jeffrey 35-B SHORTWALL Coal Cutter.

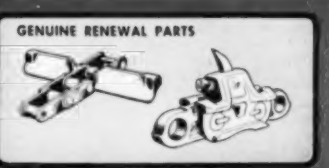












JEFFREY

EQUIPMENT FOR COAL MINES

and

GENUINE RENEWAL PARTS

THE JEFFREY MANUFACTURING COMPANY

Established 1877

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JEFFREY MANUFACTURING CO. LTD., Montreal, Quebec
BRITISH JEFFREY-DIAMOND LTD., Wakefield, England
JEFFREY-GALION (PTY.) LTD., Johannesburg

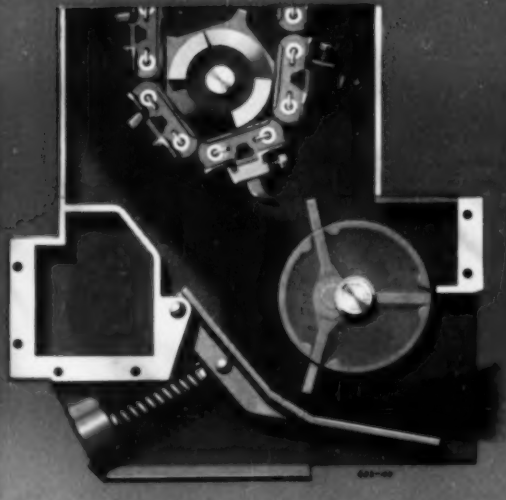
THIS SLACK HANDLING DEVICE . . .

- Discharges slack along side of cutter away from the kerf, assuring a better fall of coal.
- Eliminates cleaning kerf by manual labor.

The device can be easily added to your present Jeffrey 35-B and BB SHORTWALL Machines by removing the old bed frame extension and bolting to machine. As simple as that.

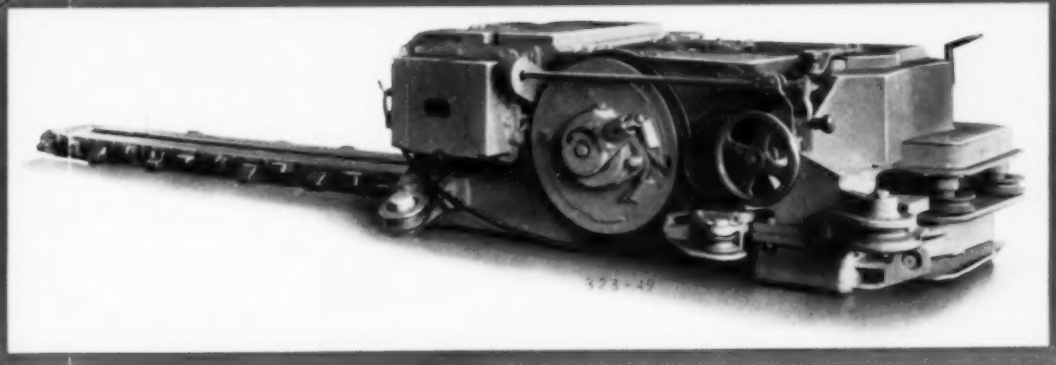
A control lever is provided to disengage the drive mechanism when machine is not cutting, or is being positioned for cutting or moving. Gearing protected by shear pin.

Note the clean kerf in the large

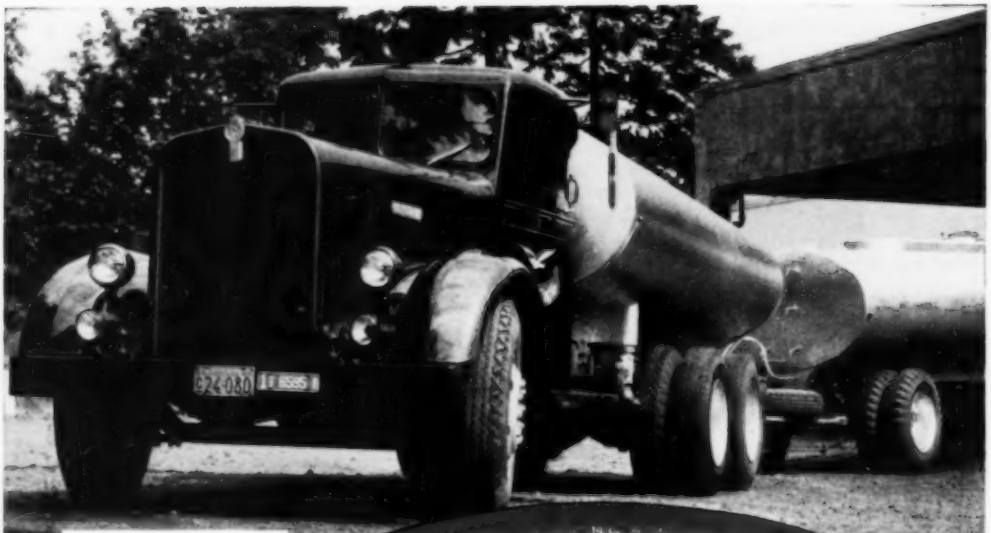


The drawing (left) gives a good idea of the principle of this NEW Slack Handling Device. Manganese steel paddles move the cuttings from the cutter chain to rear of machine. Paddles have an eccentric movement and are driven by the paddle drum.

the large illustration above.



Another view of a Jeffrey 35-B SHORTWALL with the Slack Handling mechanism in place.



Julius Gaussoin, President
Silver Eagle Company

"We recommend FULLER Transmissions without reservations"

Julius Gaussoin, president of the Silver Eagle Company, Portland, Oregon, haulers of petroleum products in Oregon and Idaho, is high in his praise of Fuller Transmissions and Auxiliaries. He says:

"We recommend Fuller Transmissions without reservations. We are operating 40 Fullers over tough mountain grades pulling 72,000 lbs. without trouble. Main transmissions run in excess of 300,000 miles . . . auxiliaries over 500,000 . . . without major repairs—and after that mileage, usually only an occasional bearing replacement."

The average mileage of Mr. Gaussoin's trucks . . . all units are full truck and full trailer . . . is 11,300 miles per month. Three of his trucks have totaled more than 2,000,000 miles—over 700,000 miles each.

Mr. Gaussoin's statement is based on the Silver Eagle Company's long experience with Fuller Transmissions and Fuller Auxiliaries . . . an experience that has been shared by thousands who recommend them without reservation: to the driver for easier shifting . . . to the mechanic for simplified servicing . . . to the owner for longer work-life.

Fuller TRANSMISSIONS

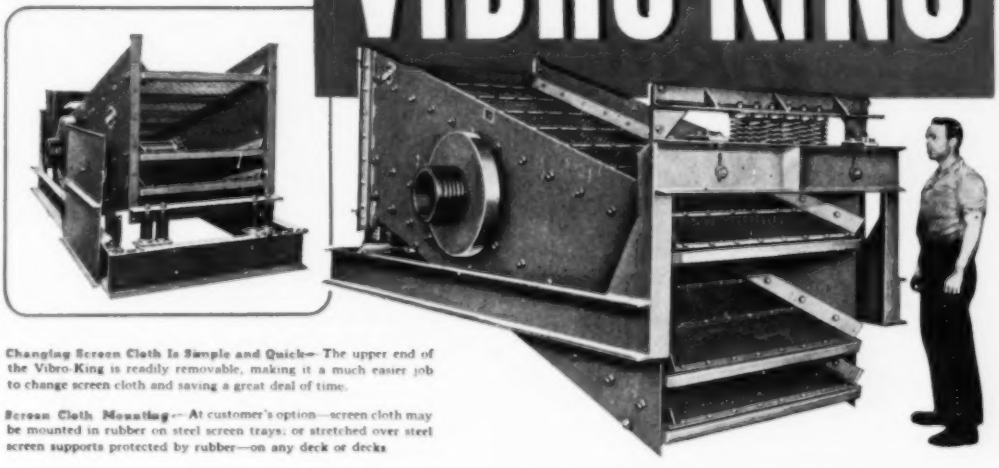
FULLER MANUFACTURING COMPANY (Transmission Division), KALAMAZOO 13F, MICHIGAN

Unit Drop Forge [illegible] SERVICE—BOTH DIVISIONS), 1060 E. 11th Street, Oakland 6, Calif.

trouble-free screening

with the

TELSMITH VIBRO-KING



Changing Screen Cloth Is Simple and Quick— The upper end of the Vibro-King is readily removable, making it a much easier job to change screen cloth and saving a great deal of time.

Screen Cloth Mounting— At customer's option—screen cloth may be mounted in rubber on steel screen trays; or stretched over steel screen supports protected by rubber—on any deck or decks

● **Simpler in design and more efficient, with lower upkeep—the Telsmith Vibro-King has only two bearings instead of the usual four. The vibrating unit is mounted on these two heavy-duty roller bearings. The Telsmith-patented automatic counterweights assure smooth starting and stopping as well as exceptionally smooth operation. The circular screening movement is uniform everywhere on the screen cloth, and is constant under any load. Entire vibrating mechanism, including vibrating unit and screen cloth, floats on nests of springs. Adjustment to the right screening angle is quick and easy. It's a really rugged screen, too. The welded and reinforced main frame is *horizontal*—for rigidity, and easier installation. Cable suspension if desired. Made in several sizes with 1, 2 or 3 decks. Get Bulletin V-66.**

Telsmith Vibro-King screen being used by **WILCOX COAL CO.** in their plant at Beckley, W. Va.

SMITH ENGINEERING WORKS, 516 EAST CAPITOL DRIVE, MILWAUKEE 12, WISCONSIN

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Brandeis M. & S. Co., Inc., Louisville 8, Ky. — Rish Equipment Co., Charleston 22, & Clarksburg, W. Va. — Rish Equipment Co., Roanoke 7, & Richmond 10, Va. — Tractor & Eqpt. Co., Inc., Birmingham 1, Ala.

Your Mine Cars

Track stability is one of the most important factors in operating large, modern mine cars at higher haulage speeds with heavier loads. Cars derailed by pushing or buffing at gathering points take time and effort to get them back on the track. Derailments from surging of cars in loaded trips can cause costly damage to both cars and track.

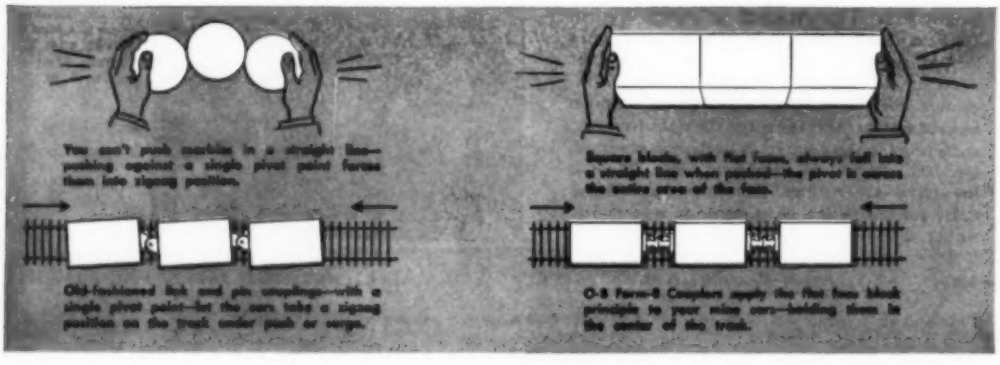
O-B Form-8 Automatic Couplers will help prevent derailments by keeping your mine cars centered on the track. Pushing, buffing and surging forces cannot put your cars into the zigzag position that drives them off the rail. The stronger the pushing or surging force—the straighter the Form 8 holds your cars in line.

Here's how O-B's Form-8 Coupler works to keep your cars centered on the track—

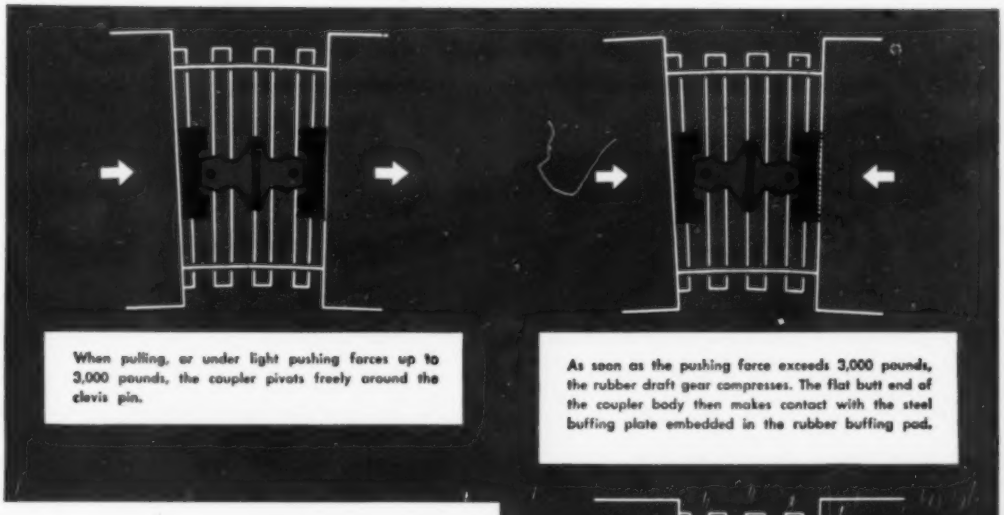
Under pulling and up to 3,000 pounds pushing force, the coupler body pivots freely around the clevis pin.

As the force increases over 3,000 pounds, the rubber draft gear compresses and the wide ends of the coupler body bear against the steel plate embedded in the rubber buffing pad. This changes the pivot from a single point to a broad pivoting area be-

D024-AM

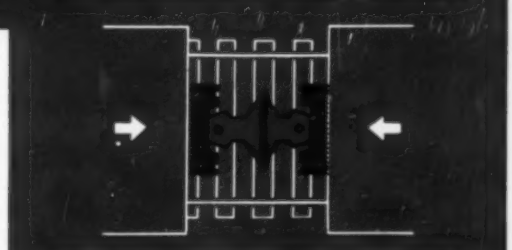

You can't push marbles in a straight line—pushing against a single pivot point forces them into zigzag position.
Square blocks, with flat faces, always fall into a straight line when pushed—the pivot is across the entire area of the face.
Old-fashioned link and pin couplings—with a single pivot point—let the cars take a zigzag position on the track under push or surge.
O-B Form-8 Couplers apply the flat face block principle to your mine cars—holding them in the center of the track.

stay on the Track



When pulling, or under light pushing forces up to 3,000 pounds, the coupler pivots freely around the clevis pin.

As soon as the pushing force exceeds 3,000 pounds, the rubber draft gear compresses. The flat butt end of the coupler body then makes contact with the steel buffing plate embedded in the rubber buffing pad.



As the pushing force increases, or a heavy surge occurs with loaded cars in a trip, the flat end of the coupler body is pushed against the buffing plate. The two flat surfaces are forced together in a straight line, straightening the coupler and car on the center of the track.

tween the flat faces of the coupler ends and buffing plate.

Pushing, buffing and surging forces exerted against this wide area force the coupler and mine car into a centered position on the track.

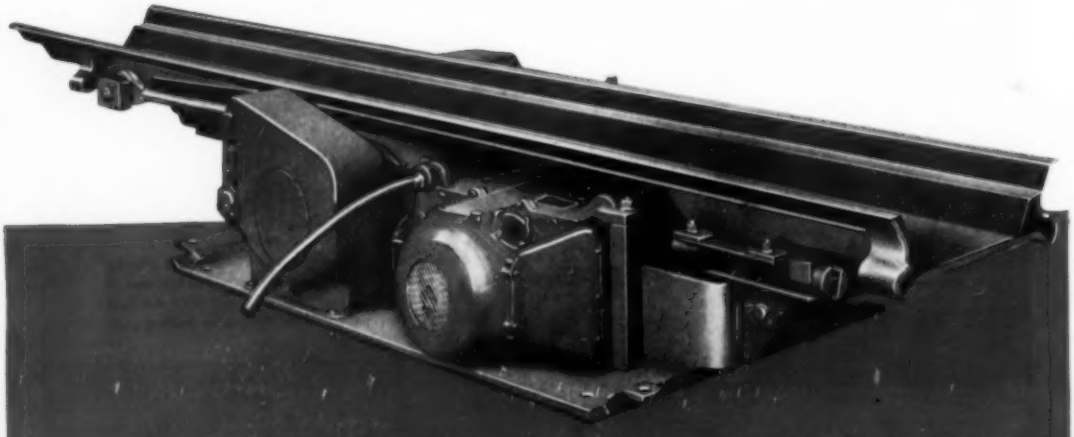
When you are specifying new mine cars, or altering the link and pin cars you now have to meet present day conditions, send us a print of the car design. We'll be glad to show you how O-B Form-8 Couplers can be installed to give your cars extra track stability.

Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd.,
Niagara Falls, Ontario

GOODMAN DUCKBILL -



THE TYPE L-20 SHAKER DRIVE

. . . low over-all height, only 24 inches.

. . . handles heavily loaded, largest size, full length trough line.

. . . discharge height — 16" min., 24" max.

Ask for Bulletin CC-494

GOODMAN MANUFACTURING COMPANY

HALSTED STREET

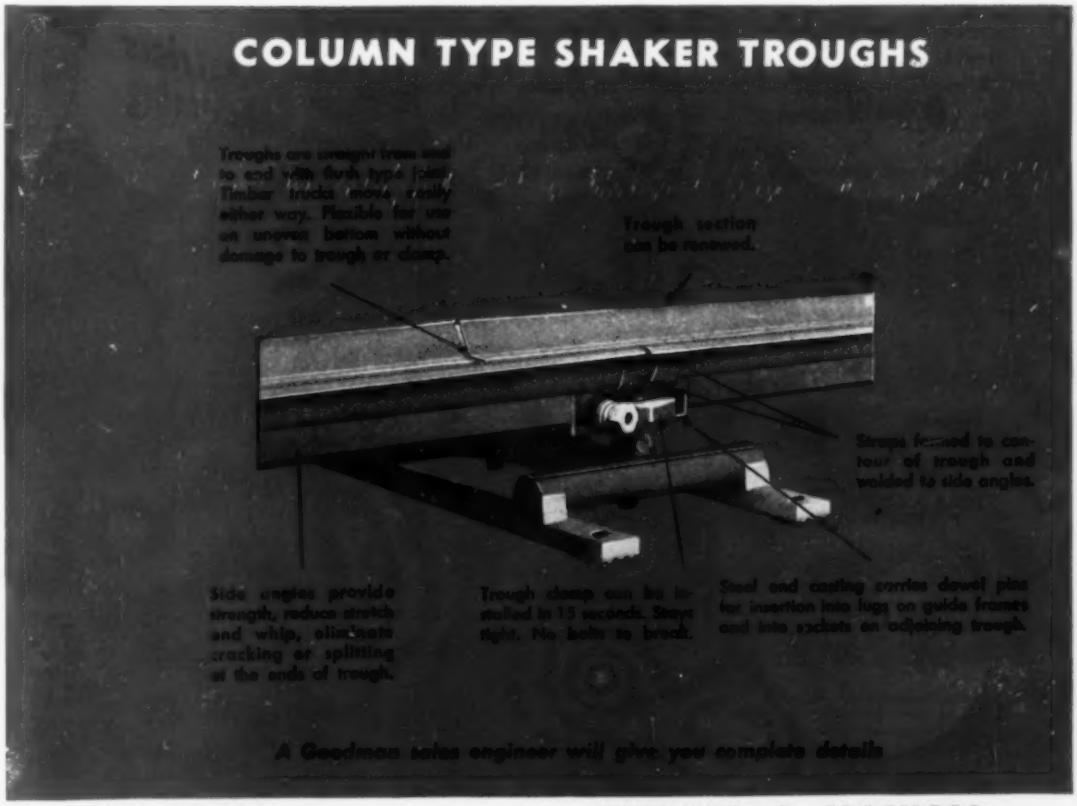
- SHAKER CONVEYORS

TWO *New* ADDITIONS TO THE GOODMAN LINE

THE L-20 DRIVE . . . a high capacity, one piece unit for low coal. It imparts a powerful, uniform motion to the trough line that moves peak loads of automatic or power duckbills in a continuous flow.

THE COLUMN TYPE TROUGH . . . saves many hours in assembly or dismantling, provides greater strength for longer wear, gives smooth operation to longer conveyor lines.

COLUMN TYPE SHAKER TROUGHS

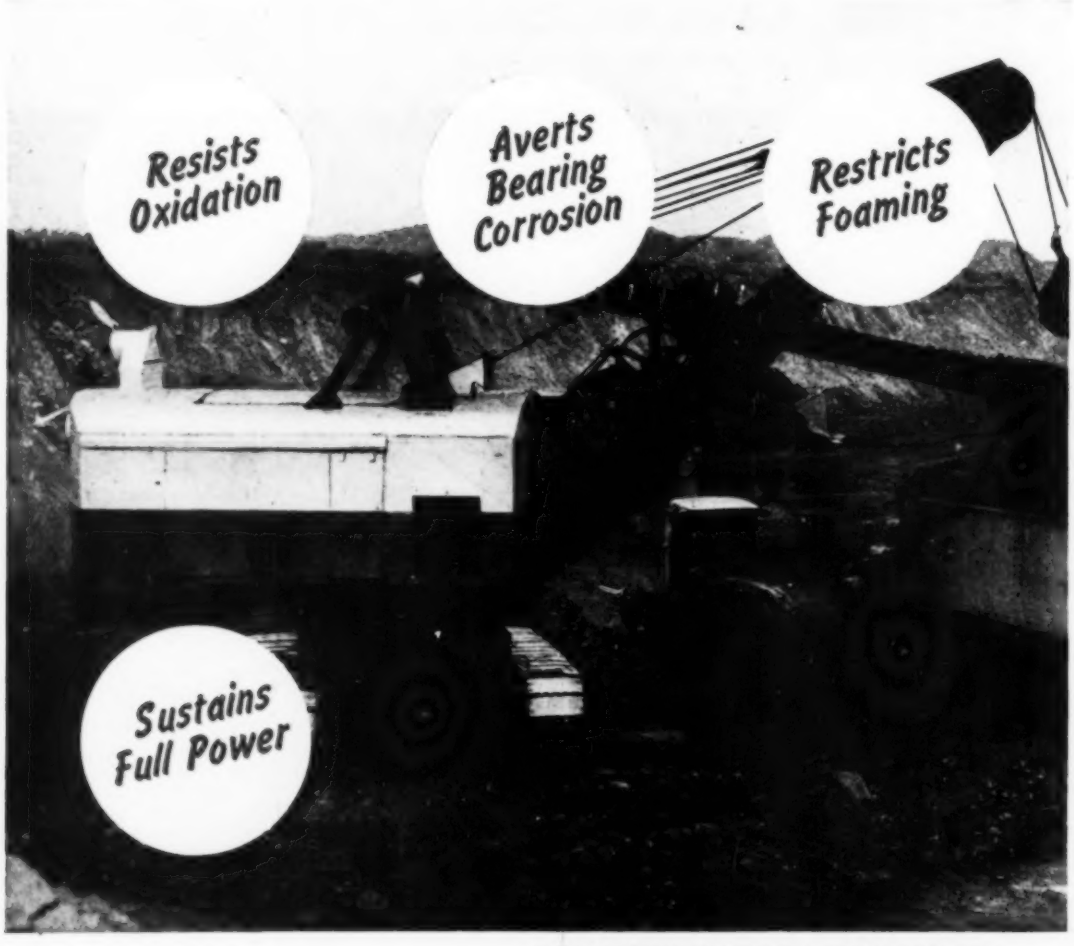

Troughs are straight from end to end with flush type joint. Timber trucks move easily either way. Flexible for use on uneven bottom without damage to trough or clamp.
Trough section can be removed.
Straps formed to contour of trough and welded to side angles.
Side angles provide strength, reduce stretch and whip, eliminate cracking or splitting at the ends of trough.
Trough clamp can be installed in 15 seconds. Stays tight. No bolts to break.
Steel and casting carries dowel pins for insertion into lugs on guide frames and into sockets on adjoining trough.

A Goodman sales engineer will give you complete details

AT 48TH • CHICAGO 9, ILLINOIS

In Great Britain: The Eickhoff Engineering Company, Ltd.

SINCLAIR TENOL Problem in



SINCLAIR

YOUR NEAREST SINCLAIR AGENT WILL GLADLY ARRANGE

Ends Sludging Diesel Equipment

A major problem of diesel engine operation is the formation of sludge, gum and varnish on valve stems, rings and other engine parts, which causes engine drag, increased operating costs and frequent tear-downs.

This problem is solved by the use of Sinclair TENOL for diesel engine lubrication. Sinclair TENOL contains special Sinclair-developed additives to prevent the formation of sludge, gum and varnish. TENOL holds these harmful elements in suspension so that they are drained out with the oil at oil change periods.

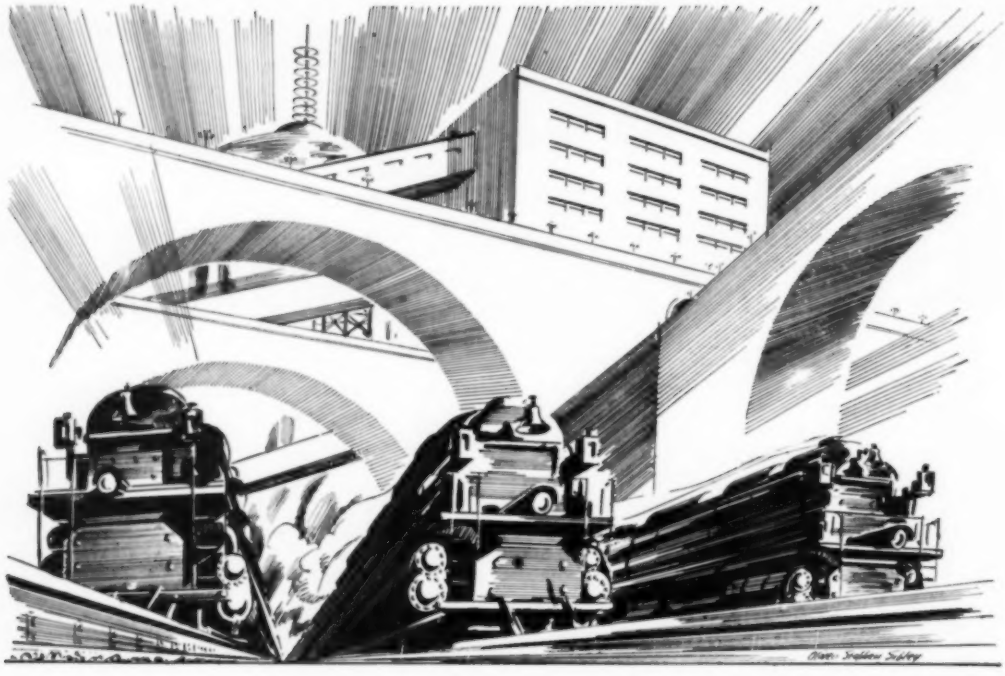
Sinclair TENOL cleans as it lubricates, thus increasing time between tear-downs and lowering cost per operating hour. Try Sinclair TENOL in your equipment.

Continued research explains the high quality of TENOL and other Sinclair Oils. Sinclair has recently completed at Harvey, Ill., one of the most modern and complete laboratories for petroleum research and development.

E. W. Isom, Sinclair Vice-President in Charge of Research says: "With the new facilities now made available to us at Harvey, Ill., we expect to find many ways to help industry cut costs through better petroleum products."

HEAVY DUTY LUBRICANTS

FOR LUBRICATION COUNSEL, OR YOU MAY WRITE TO SINCLAIR REFINING COMPANY, 630 FIFTH AVE., NEW YORK 20, N. Y.



In progress lies the future

It has been said that a railroad never stands still. Its present and future depend on forward motion, on expansion and improvement. In a word, it must "grow forward". The $86,000,000 expansion and improvement program inaugurated by the C & O Railroad is a case in point of this "grow forward" policy. Begun in 1946 when materials and manpower became available, it has surged steadily forward until now it is all but complete and C & O has what amounts to a re-made railroad.

Highly important among the improvements made to the road property was the extension of lines into new coal territory. This included fourteen separate projects involving an aggregate authorized capital expenditure of $20,377,000. It was foreseen during the initial stages of this planning that these coal branch extensions would tap and make merchantable approximately 859,249,000 tons of coal—a colossal addition to C & O's present tonnage carrying capacity, and a splendid example of how C & O gears its growth to the growth of the coal industry.

This then is progress through improvement—progress that spells a solid future—not only for the railroad and coal industries but for the general economy of the nation as well.

C AND O FOR PROGRESS

CHESAPEAKE & OHIO RAILWAY

Largest Originating Carrier of Bituminous Coal in the World

FOR HEAVY TRAFFIC

BETHLEHEM NO. 5 STEEL TIE

No. 5's being installed near the working face. Note the breadth and depth of these ties.

Heavy is what we mean . . . in the strictly literal sense. Loads that weigh a lot of tons. It's for this kind of traffic that Bethlehem's No. 5 is built and sold.

Today's mechanized equipment puts unusual burdens on the track structure. But the No. 5 steel tie is meant for these loads, and it will stand up for long periods, even when bottom conditions are not of the best. No. 5's have often been taken up and reused 25 times or more—pretty good going in anybody's mine!

Strong, thick section . . . plus full-length center support . . . means a tie that resists buckling, sagging, and bending. Though the No. 5 is slightly higher in first cost than the lighter ties, its extra life will more than offset the difference in purchase price.

Installing the No. 5 is no trick at all. Simply fit the stationary clip against the rail base; then tap the revolving clips into place. Repeat at the other end. There's your tie, ready for business, holding the rails in a double grip of steel.

We'd like to tell you more, and it makes good listening if you're interested in reducing track problems. Why not let a Bethlehem man give you the full story?

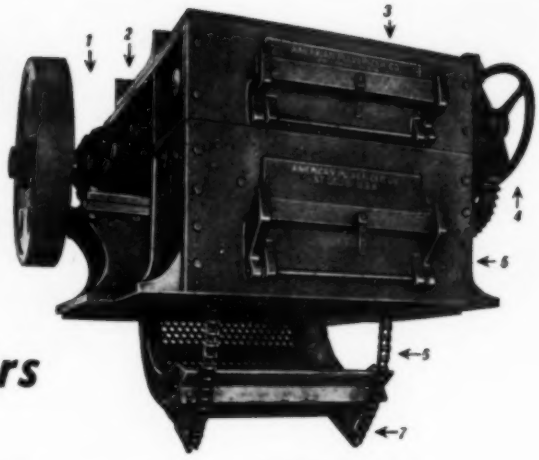
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

A NEW ANGLE TO COAL PREPARATION

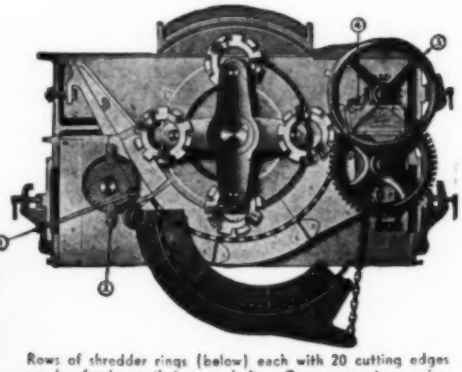
With American Rolling Ring Crushers



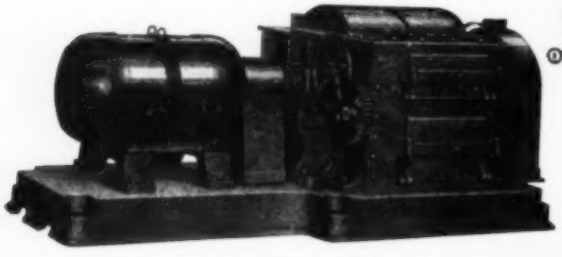
7 OPERATING FEATURES

(1) Dust-tight, grease-lubricated, self-aligning pillow blocks with anti-friction bearing. (2) Massive sectional steel frame with dust-tight machined joints. (3) Door to easily cleaned metal trap. (4) Hand-wheel to adjust the position of setting of cage. (5) Inspection door to crushing chamber. (6) Chains to raise and lower cage. Raising cage makes product finer, lowering cage makes product coarser—or cage can be dropped completely as shown. (7) Screen cage with sectional manganese steel side liners.

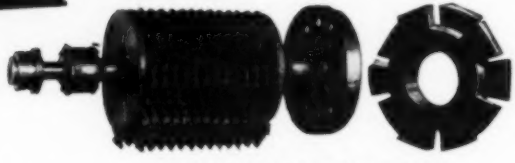
The gains in tonnage underground are too easily offset by obsolete coal preparation at the top, resulting in too small a yield of the most marketable sizes. Control your sizing with the most modern crusher action which *splits*—instead of crushes—coal. Size control is continuously maintained with a minimum of undesirable fines—and with no oversize. Americans are flexible, with a wide range of reduction, to suit varying market demands.



Rows of shredder rings (below) each with 20 cutting edges revolve freely on their own shafts. Cage prevents oversize, rotor revolves slowly, keeping fines to a minimum.



Americans are available in capacities of 50 to 500 TPH.



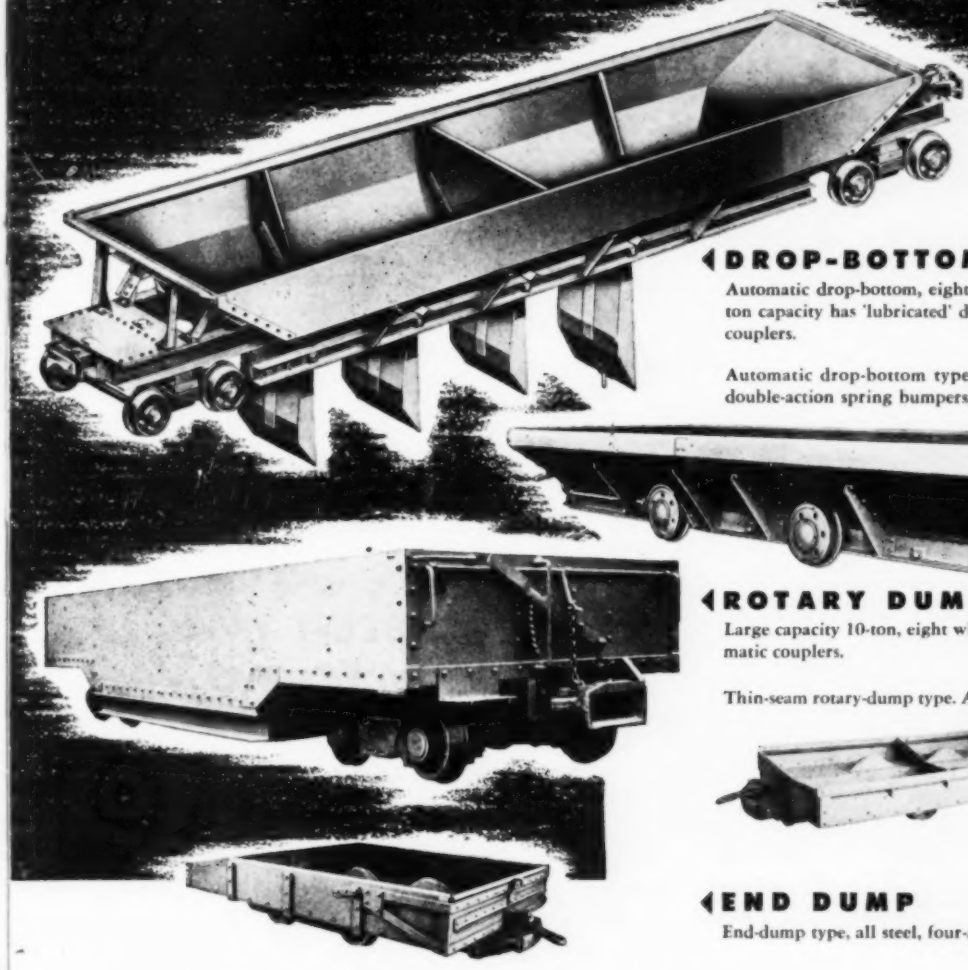
Write for "AC Coal Crushing Bulletin."

American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

1119 Macklind Avenue
St. Louis 10, Mo.

NO MATTER HOW YOU UNLOAD COAL...



DROP-BOTTOM

Automatic drop-bottom, eight-wheel car with 12 ton capacity has 'lubricated' doors and automatic couplers.

Automatic drop-bottom type, welded end sills, double-action spring bumpers, 'lubricated' doors.

ROTARY DUMP

Large capacity 10-ton, eight wheel car, with automatic couplers.

Thin-seam rotary-dump type. All steel. Four axles.

END DUMP

End-dump type, all steel, four-axle mine car.

a.c.f. MAKES ALL THREE!

a.c.f.

For help on any coal-transportation problems, call your nearest A.C.F. Sales Representative.

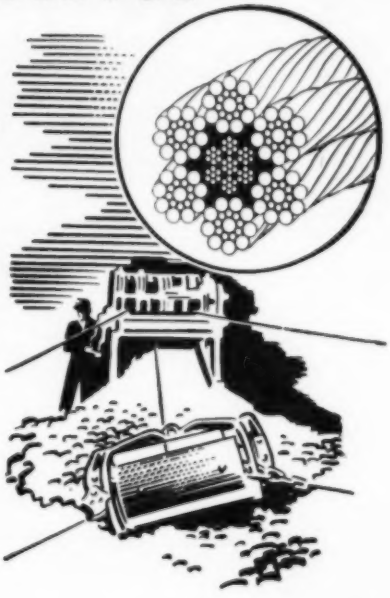
AMERICAN CAR & FOUNDRY COMPANY, NEW YORK • CHICAGO
CLEVELAND • WASHINGTON • HUNTINGTON, W. VA. • ST. LOUIS
BERWICK, PA. • PITTSBURGH • PHILADELPHIA • SAN FRANCISCO

MINE CARS

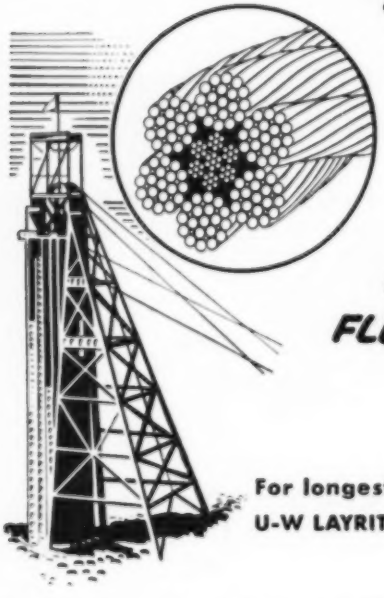
for Greater Mining Efficiency

SOME ROPES FOOL YOU

U-W 6×19 SEALE IS AN EXCELLENT CONSTRUCTION FOR SLUSHER OR SCRAPER PULL ROPES BECAUSE IT HAS VERY COARSE OUTER WIRES TO RESIST ABRASION



BUT...



FOR MINE SHAFT ROPES U-W 6×19 FILLER WIRE IS BETTER BECAUSE IT IS MORE FLEXIBLE AND RESISTS FATIGUE EXCEPTIONALLY WELL.

For longest and best service, always specify
U-W LAYRITE (*Preformed*) **IMPROVED PLOW STEEL**

We invite you to let UPSON-WALTON engineer your tough rope jobs.

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THE UPSON-WALTON COMPANY
Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks, Brattice Cloth
Main Offices and Factory: Cleveland 13, Ohio

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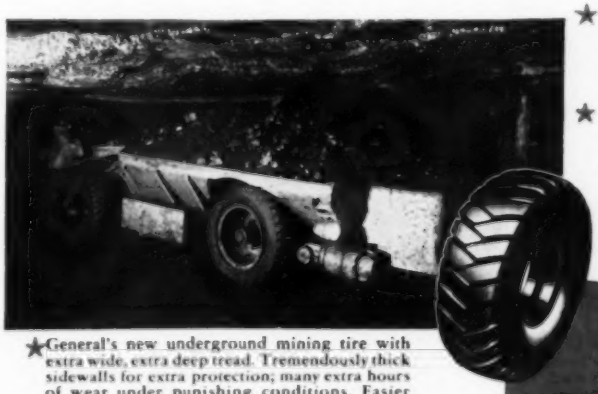
OVER SHARP ROCKS, DEEP RUTS, MUD, SLUSH AND GRAVEL, *Generals* MOVE HEAVY LOADS OUT AND OVER THE HIGHWAY

Faster, Cheaper, Safer

Here's the answer to your tire problems. Two great General tires built to take bruising punishment on jagged strip mine roads. The *General L. C. M.* for trucks that work 80% in the stripping area—20% on the highway. The *General H. C. T.* for some work off the road—most work over the highway. A dual-purpose team to answer important hauling problems in your mining operation. More mileage, longer wearing, double-duty tires that mean big savings in time, labor and money to you.

★ L.C.M. —Extremely thick, tough tread cushions tire surface against snags and cuts. Tremendous self-cleaning shoulders throw off mud and rocks, while deep cleats develop powerful traction.

★ H.C.T. —Double-thick, tough tread. Greater blowout protection. Extra deep tread grooves develop extra traction through mud, slush and gravel . . . prevent slipping and spinning.



★General's new underground mining tire with extra wide, extra deep tread. Tremendously thick sidewalls for extra protection; many extra hours of wear under punishing conditions. Easier steering, more traction.

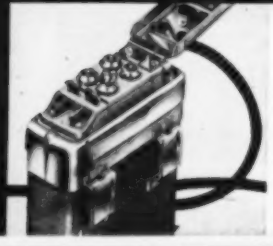
The GENERAL TRUCK TIRE

THE GENERAL TIRE & RUBBER CO., AKRON, OHIO

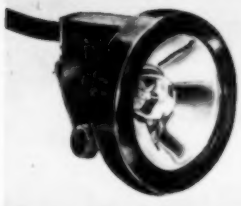
new

U. S. BUREAU OF MINES APPROVED

25%



The tough nylon plastic battery case is exceptionally resistant to abrasion, denting and impact. All exposed parts are of stainless steel.



Comfortably balanced headpiece contains an efficient gas-filled bulb with two filaments of equal candle power. New bezel locking device permits quick removal and reassembly of the reflector, bulb or rubber-cushioned lens.

brilliance for even greater mining efficiency

with the new EDISON ELECTRIC CAP LAMP *model* R-4

New from headpiece to battery case, the brilliant Edison Model R-4 gives better light for the miner on every job . . . gives at least 25% more light than other miner's cap lamps. With its increased candle power, the Model R-4 gives a new brilliance that means greater safety for miners and improved mining efficiency—an achievement worthy of the great name, Edison.

Another Edison first in mine lighting is the new focusing headpiece. The brilliant, unfailing, dependable light can be focused to an intense "spot," or a floodlight provided as the job requires.

HEADLINE FEATURES

- ***Positive "Spot"* Adjustment**
- ***Floodlight* When Required**
- ***Comfortably Balanced* Headpiece**
- ***Four-Cell Edison* Nickel-Iron-Alkaline Battery**
- ***Welded Steel* Cell Containers**
- ***Tough Nylon Plastic* Outer Case**

more light

than ever before available in a miner's cap lamp

Demonstrations and detailed facts? Gladly, upon request.

MINE SAFETY APPLIANCES COMPANY

BRADDOCK, THOMAS AND MEADE STREETS . . . . . PITTSBURGH 8, PA.

At Your Service: 48 BRANCH OFFICES in the UNITED STATES

MINE SAFETY APPLIANCES CO. OF CANADA LIMITED · Toronto, Montreal, Calgary, Winnipeg, Vancouver, New Glasgow, N. S.

MINE SAFETY APPLIANCES CO. (S.A.) (PTY.) LTD. · Johannesburg, South Africa; N'Dola, No. Rhodesia; Bulawayo, So. Rhodesia

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MSA SAFETY FOOTPOINT HEADQUARTERS

Here's Concentrated Power For Multiple Shooting

THE DU PONT MULTIPLE-SHOT PERMISSIBLE BLASTING MACHINE

Compact...Sturdy...Water-Resistant

This ten-cap permissible blasting unit offers a liberal factor of safety at its rated capacity. It's an efficient machine and has full approval of the U. S. Bureau of Mines.

It is patterned after the popular Du Pont No. 10 Twist Blasting Machine manufactured by Fidelity Electric Company . . . a model widely used for more than 25 years. The unit embodies many refinements in electric and mechanical design and has been proved satisfactory and practical by field experience of more than a year.

Voltage in this machine is built up to maximum with a simple twist of the handle. An automatic switch closes at peak output and limits the duration of discharge to less than 30 milliseconds . . . as required by the permissibility code of the Bureau of Mines. It's a compact unit . . . strongly made and highly water-resistant.

GENERAL SPECIFICATIONS

Rated Capacity	**10 E. B. Caps**
Type	**Twist handle; shunt-wound generator.**
Weight	**Gross: 5 lbs., 1 oz.**
	Net: 4 lbs., 12 oz.
Dimensions of case	**5.5" x 4.0" x 3.5"**
Height (including handle)	**8.0"**

Du Pont Multiple-Shot Permissible Blasting Machines are available for immediate shipment from supply points located in coal mining areas throughout the United States.

Any Du Pont Explosives representative will gladly give you further information about this new and improved multiple-shot blasting machine. Ask about it now. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

DU PONT
EXPLOSIVES
Blasting Supplies and Accessories

DU PONT

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

ROOF-BOLTING TEAM!

JOY MINE-AIR COMPRESSORS and STOPERS

Check these Advantages!

★ JOY COMPRESSORS . . . B of M-approved, and less than 30" high. Rubber tire and track models, either self-propelled or draw-bar types. Two sizes: 130 or 175 CFM at 115 PSI. Compressors are two-stage, single acting, air-cooled—highly efficient and reliable.

★ JOY STOPERS . . . Complete line down to 21" high for roof-bolting applications. These stopers do the entire job: drill the hole, drive the bolt and wedge—and as an *exclusive* feature, have a built-in torque wrench for tightening the nut.

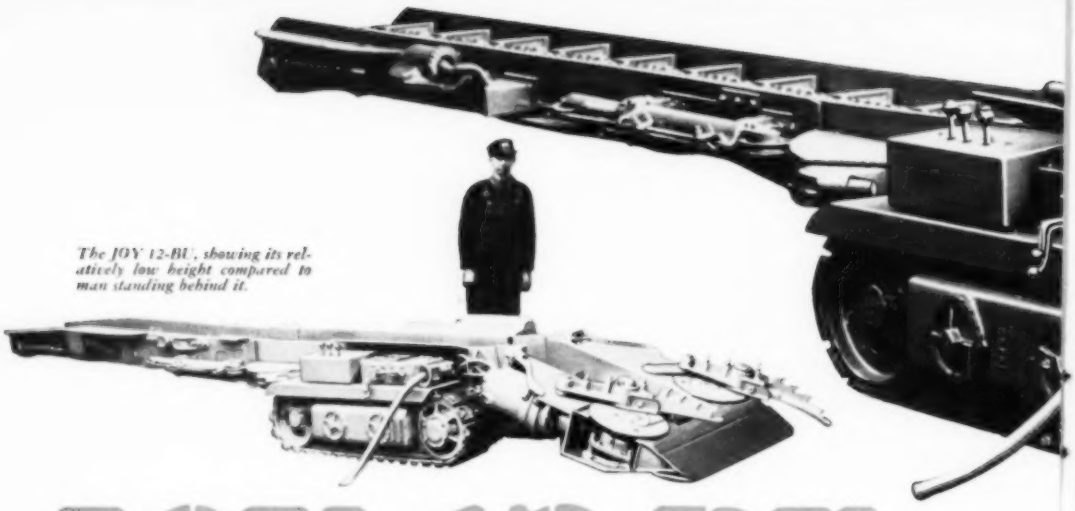
Consult a Joy Engineer

WAD CL 2101

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

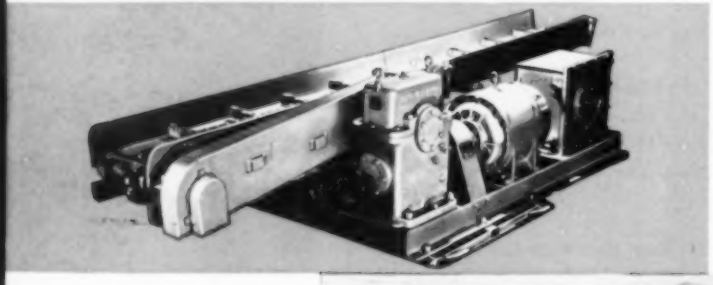
IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO



The JOY 12-BU, showing its relatively low height compared to man standing behind it.

JOY 12 BU-

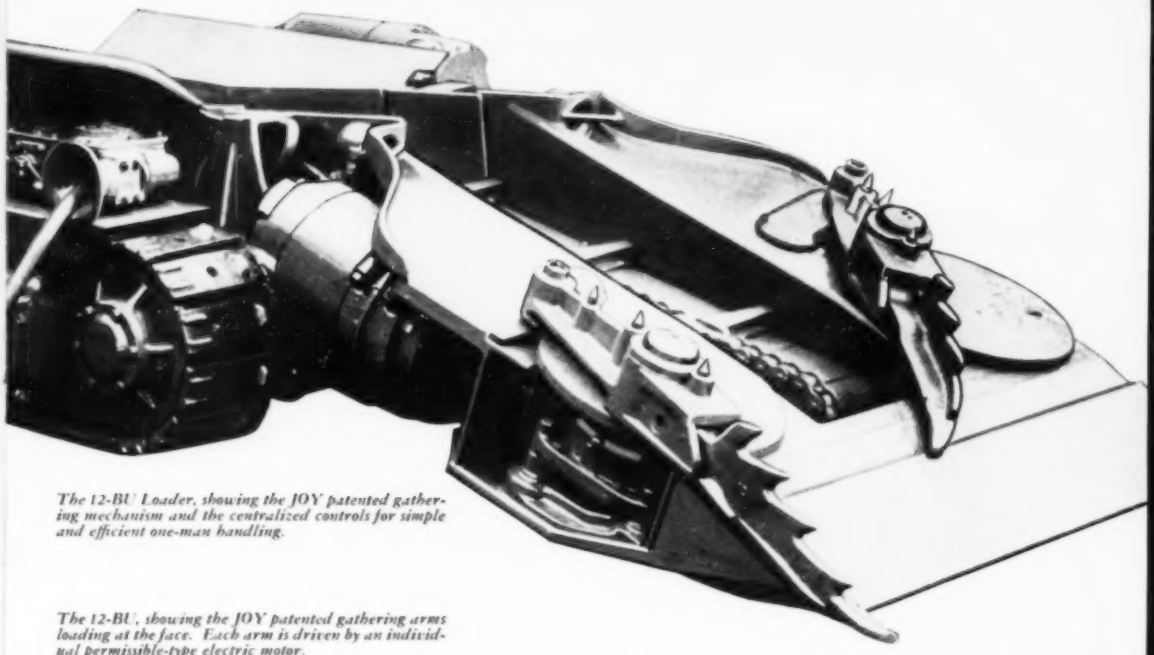
THE LOADER THAT SETS THE PACE IN LOW SEAMS



The JOY 12-BU Loader was designed and built specifically to cut costs in thin-seam operation. It is a mobile unit only 28 3/4" high, which will operate efficiently in 30" seams under proper conditions. Particularly suited for loading on conveyors in thin seams, but can be adapted for loading into mine cars in higher seams. The JOY patented articulated chain conveyor may be swung 45° either side of center. For details of the 12-BU, or other JOY Loaders to suit any mining condition, *write for bulletin.*

Perfect mate to the 12-BU in thin-seam mining—the JOY 15" Chain Conveyor. Cut shows driving mechanism. Sections may be added for any desired length.

The 12-BU Loader working in a thin seam. The caterpillar treads are driven by individual motors. Permissible electric construction throughout... all parts in control system readily accessible.



The 12-BU Loader, showing the JOY patented gathering mechanism and the centralized controls for simple and efficient one-man handling.

The 12-BU, showing the JOY patented gathering arms loading at the face. Each arm is driven by an individual permissible-type electric motor.

The 12-BU loading in a thin seam. The entire machine has been ruggedly built for heavy-duty service and low maintenance.

Consult a Joy Engineer

W&D CL 2092

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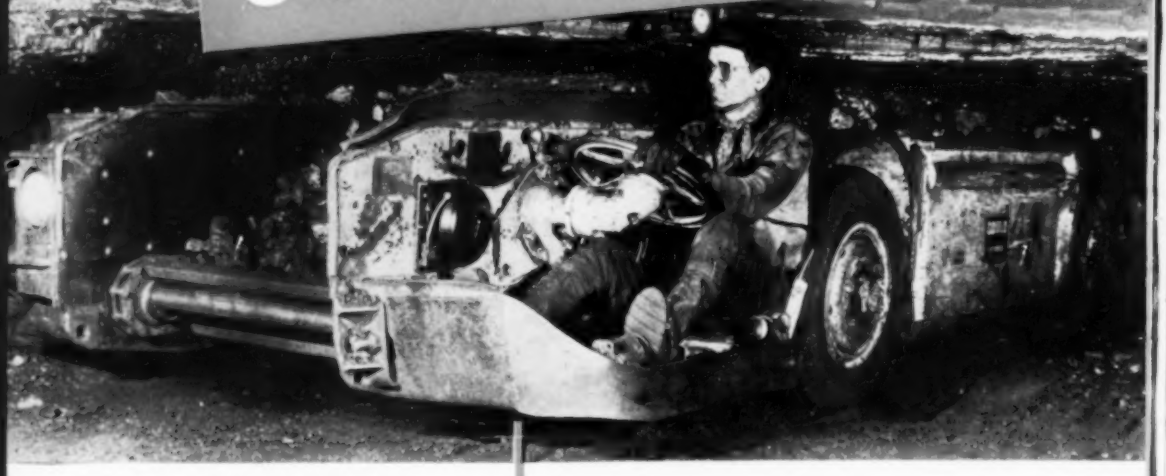
For fast economical transfer in thin seams, you're ahead with

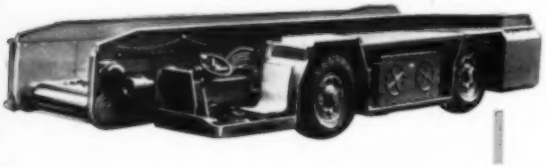
JOY 32" SHUTTLE CARS



In operation, above: the JOY 32-D Shuttle Car, battery-powered for greatest flexibility and faster tramming. Has straight discharge, mechanical steering. Capacity is approximately 3½ tons. When using in thicker seams, removable sideboards and tailboards may be added to increase capacity.

★

Below: the JOY 32-E Shuttle Car, hydraulic cable-reel type. Another 32" JOY Cable Reel Shuttle Car, the 6-SC, features four-wheel drive and four-wheel steering—makes right angle turns easily. Both may have either fixed high, fixed low or hydraulic-adjustable elevating discharge.



JOY Cutters, Loaders, Shuttle Cars and Conveyors can win production and cost advantages for you— no matter what your mining conditions are

Consult a Joy Engineer

W&D CL 2213

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GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

WHEN YOU NEED HIGH STRENGTH STEELS—*CALL Us!*

REMEMBER, when you use U·S·S COR-TEN or U·S·S MAN-TEN, instead of carbon steel, your steel supply will go one-third farther. Our warehouses from coast-to-coast will do their best to supply your needs in any of these four High Strength Steels—"The steels that do more." Phone, wire or write the warehouse or sales office nearest you.

U·S·S COR-TEN — A steel that has a yield point 1½ times that of structural carbon steel . . . that has greater impact strength and abrasion resistance . . . and whose resistance to atmospheric corrosion is 4 to 6 times higher.

U·S·S MAN-TEN—A steel that has twice the atmospheric corrosion resistance of plain carbon steel. Tough . . . high strength . . . hard-wearing and highly resistant to shock and vibration.

U·S·S ABRASION-RESISTING—Fills need for a low-cost, abrasion-resistant steel. Costs little more than plain carbon steel. In certain applications wears as well—sometimes better—than higher priced alloys.

U·S·S MANGANESE-NICKEL-COPPER — Affords weight reduction through high strength, greater toughness and improved characteristics in applications involving cold forming, metal arc welding and moderately severe impacts in low temperature service.

Fill in and mail the coupon NOW for free booklets on U·S·S High Strength Steels.

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Dept. A-89, 208 S. La Salle St., Chicago 4, Ill.
Without obligation on our part, please send us free booklets on U·S·S High Strength Steels.

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Warehouses: BALTIMORE · BOSTON · CHICAGO
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USS

UNITED STATES STEEL

This High Cost...

without a Friend among Management or Workers—

Can Be Cut Immediately!

INDUSTRIAL eye accidents occur at the rate of two a minute. They average more than $5 per employed worker per year in cost. In the campaign to maintain production, wages and profits at rewarding levels, an American Optical Company eye protection program that can prevent 98% of these accidents merits serious consideration. (One large company saved over $44,000 annually with an AO program.)

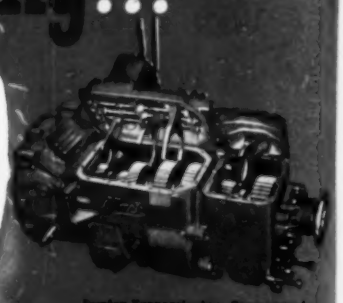
Your MSA Representative has complete case histories showing *how much* the AO program does and *how little* it costs! Ask him to call.

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts • Branches in Principal Cities

Inside Reasons Why...

MACK TRUCKS
Take Out Bigger Payloads
Bring In Bigger Profits



Sunbeat Transmission. Four-speed main transmission and two-speed compound assembled as a unit. Provides eight forward and two reverse speeds. Most rugged and efficient truck transmission in standard production today.

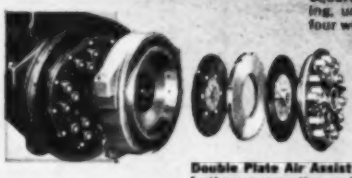
• In every part, Mack trucks are built to "take it" when it comes to taking out bigger loads with utmost economy!

Here are some of the "inside reasons" why Mack trucks build profits for you by hauling bigger tonnage on faster, uninterrupted schedules.

Massive Frame electrically fused into single unit. Alloy-steel I-beam side members are reinforced and braced by huge cross members. Capable of carrying great loads and standing up under tremendous shock.

Balanced Angle for mastery of the toughest terrain. Exceptional flexibility insures equal traction, even tire loading, uniform braking on all four wheels.

Exclusive Power Divider. Delivers torque proportionately to wheels having the most traction. Eliminates dissipation of power in useless slippage and wasteful wheel spinning.



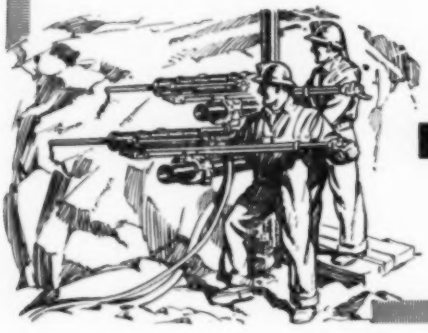
Double Plate Air Assist Clutch. Effortless in operation, reduces driver fatigue, requires minimum maintenance throughout its long life.

IT'S PART OF THE LANGUAGE:

"Built Like a Mack Truck!"

Mack Trucks, Inc., Empire State Bldg., New York, N.Y. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

You Produce More Rock With Less Drilling



Using The ROCKMASTER "16" Blasting System!

RIGHT from the start, ROCKMASTER "16" means less drilling in pits, quarries, construction jobs, and underground workings! Drill holes for primary blasting can usually be spaced wider apart; and, because you get better breakage, drilling for secondary blasting is cut to a minimum—sometimes eliminated.

This means your shovels or mechanical loaders can move in sooner . . . can move more properly broken material with less wear and tear on equipment. What's more, this better breakage you get with ROCKMASTER "16" cuts down crushing and milling costs.

This is only part of the reason blasters, on the surface and underground, hail ROCKMASTER "16" as the greatest improvement in blasting methods since Atlas introduced milli-second blasting. ROCKMASTER "16" helps you produce more material per pound of explosive . . . gives you more footage per round. *Sixteen* periods—a wide choice of short or long milli-second delay intervals—add up to better control over throw, backbreak, and material size. *Sixteen* delay periods fire in 550 milli-seconds, and to underground blasters this means less strain on timbers and roof . . . less dust and a quicker return to the face.

Ask your Atlas representative for your copy of the new ROCKMASTER booklet, which will show you how ROCKMASTER "16" fits into your operations.

ROCKMASTER "16" TIMINGS

Rockmaster No.	Avg. Time of Each Delay from Zero (milli-seconds)
0 (zero)	0 (inst.)
1	8
2	25
3	50
4	75
5	100
6	125
7	150
8	175
9	200
10	250
11	300
12	350
13	400
14	450
15	500
16	550

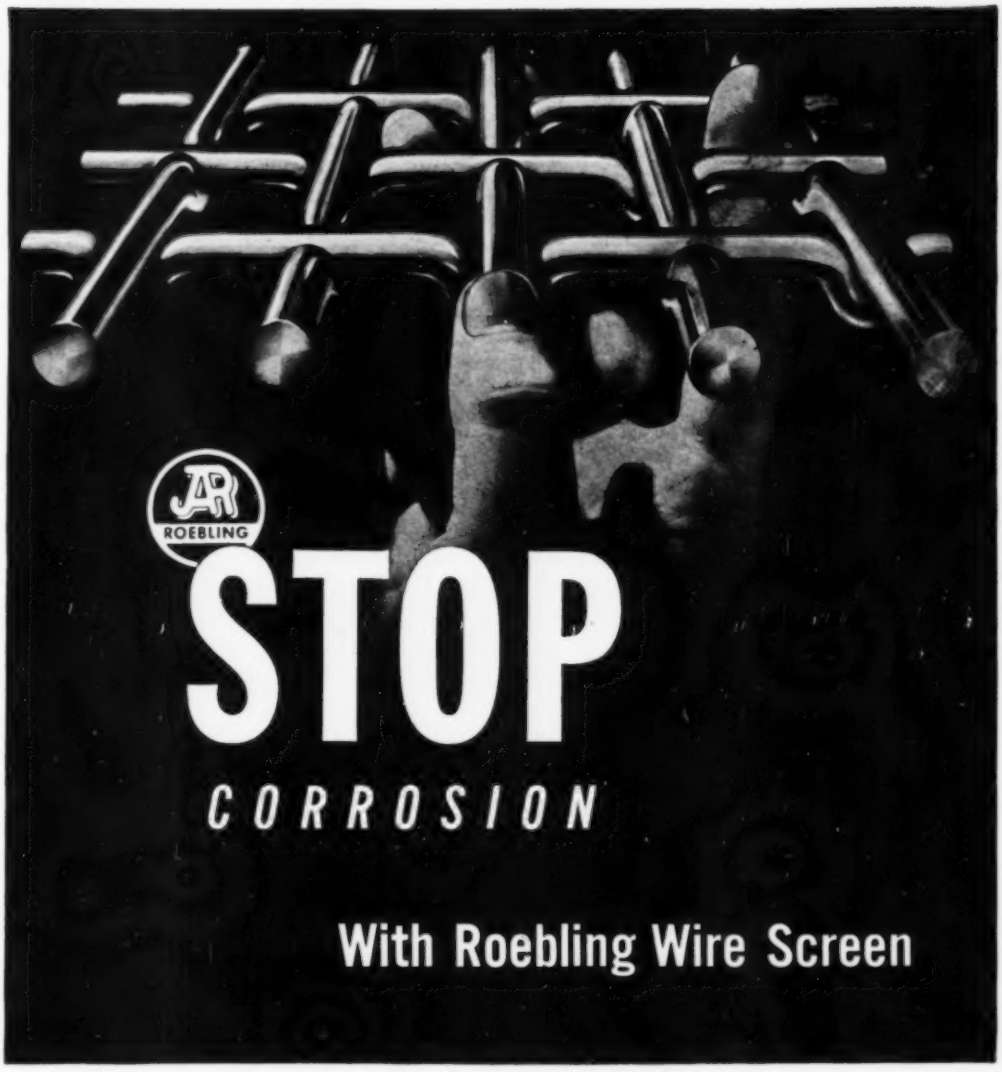
ROCKMASTER: Reg. U. S. Pat. Off.

ATLAS EXPLOSIVES

"Everything for Blasting"

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address*—Atpowco



THE RIGHT METAL FOR EVERY NEED

WHATEVER YOUR CORROSION PROBLEM, Roebling screens woven of the *right* metal will lick it once and for all. Depending on requirements, various meshes can be furnished in stainless steel, copper, or brass 80-20. Also available are monel, aluminum, and bronze 90-10. There are two new types of Hastelloy, "B" and "C," that are highly resistant to sulphuric and chlorine acids.

Besides the corrosion resistance of the right metal, Roebling Roeflat flat construction gives 75% more wearing surface and sets new records of service life. It causes less blinding and clogging than ordinary screens . . . precision openings help assure uniform grading.

You can have Roebling Roeflat in almost any type of weave, such as Roeton, Roeslot or square mesh with openings of ¾-inch and up. Find out whether you can save screen dollars by using a Roebling screen with the specific corrosion-resistant properties to beat your problems. Write for Catalog W-905. John A. Roebling's Sons Company, Trenton 2, New Jersey.

WRITE OR CALL THE ROEBLING FIELD MAN AT YOUR NEAREST ROEBLING OFFICE AND WAREHOUSE

Atlanta, 934 Avon Ave. ★ *Boston*, 51 Sleeper St. ★ *Chicago*, 5525 W. Roosevelt Rd. ★ *Cleveland*, 701 St. Clair Ave., N. E. ★ *Denver*, 1635 17th St. ★ *Houston*, 6216 Navigation Blvd. ★ *Los Angeles*, 216 S. Alameda St. ★ *New York*, 19 Rector St. ★ *Philadelphia*, 12 S. 12th St. ★ *Pittsburgh*, 855 W. North Ave. ★ *Portland, Ore.*, 1032 N. W. 14th Ave. ★ *San Francisco*, 1740 17th St. ★ *Seattle*, 900 First Ave.

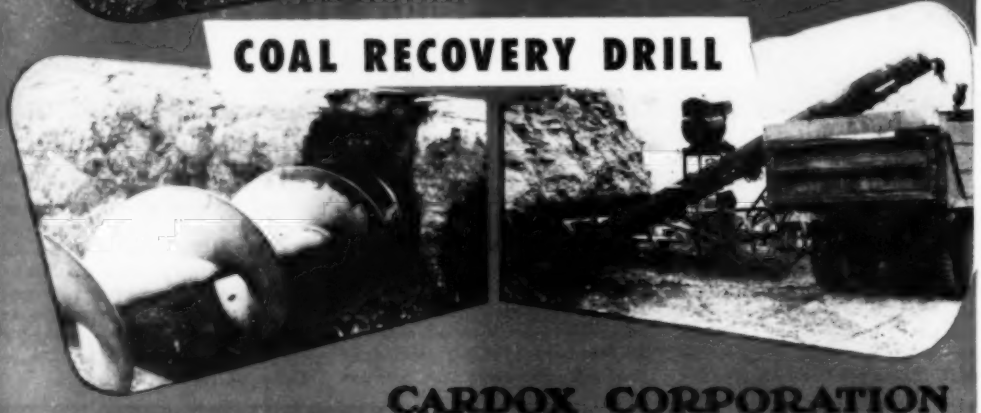
ROEBLING

☆ *A CENTURY OF CONFIDENCE* ☆

Non-Explosive

CARDOX AIRDOX

COAL RECOVERY DRILL



CARDOX CORPORATION

MINING METHODS

CARDOX and AIRDOX

CARDOX and AIRDOX are approved methods of dislodging coal at the working face without explosion, smoke, flames or noxious fumes. *Cardox* utilizes the powerful heaving action of expanding carbon dioxide, while Airdox breaks down the coal with compressed air.

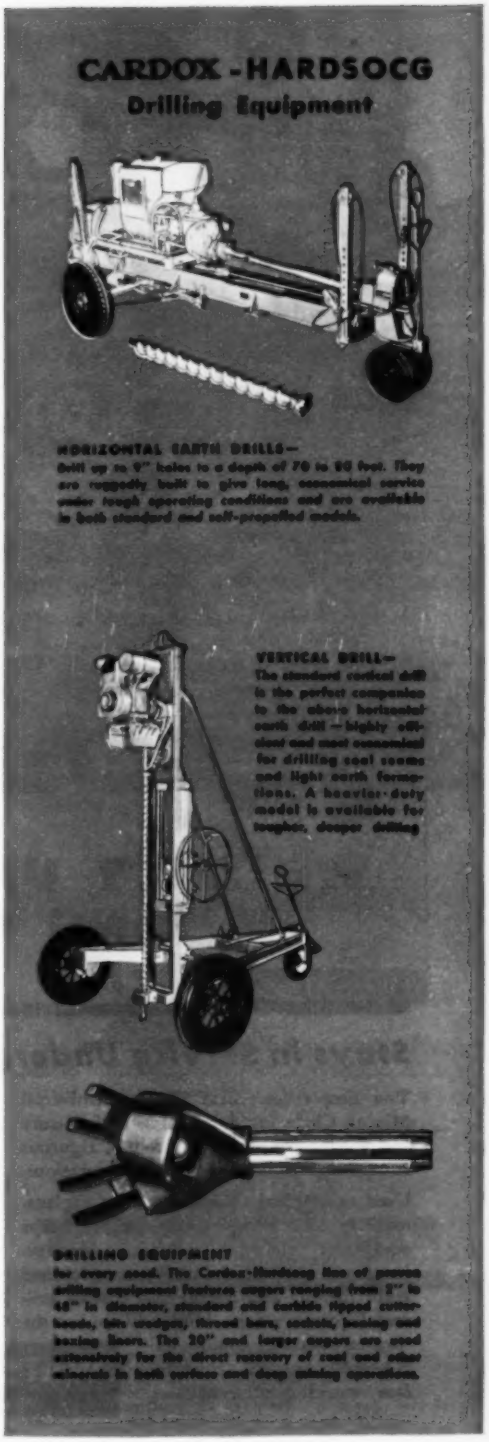
Both methods provide advantages that extend over practically every phase of production and marketing. Their mild action preserves top and ribs, produces very little dust, and eliminates shatter cracks. A decrease of from 15% to 20% in minus 2" coal, and a very large decrease in minus ¼" coal is assured when either replaces explosives. Furthermore, the firm structure of the coal withstands extensive mechanical cleaning operations and resists degradation during shipment and handling in the yards.

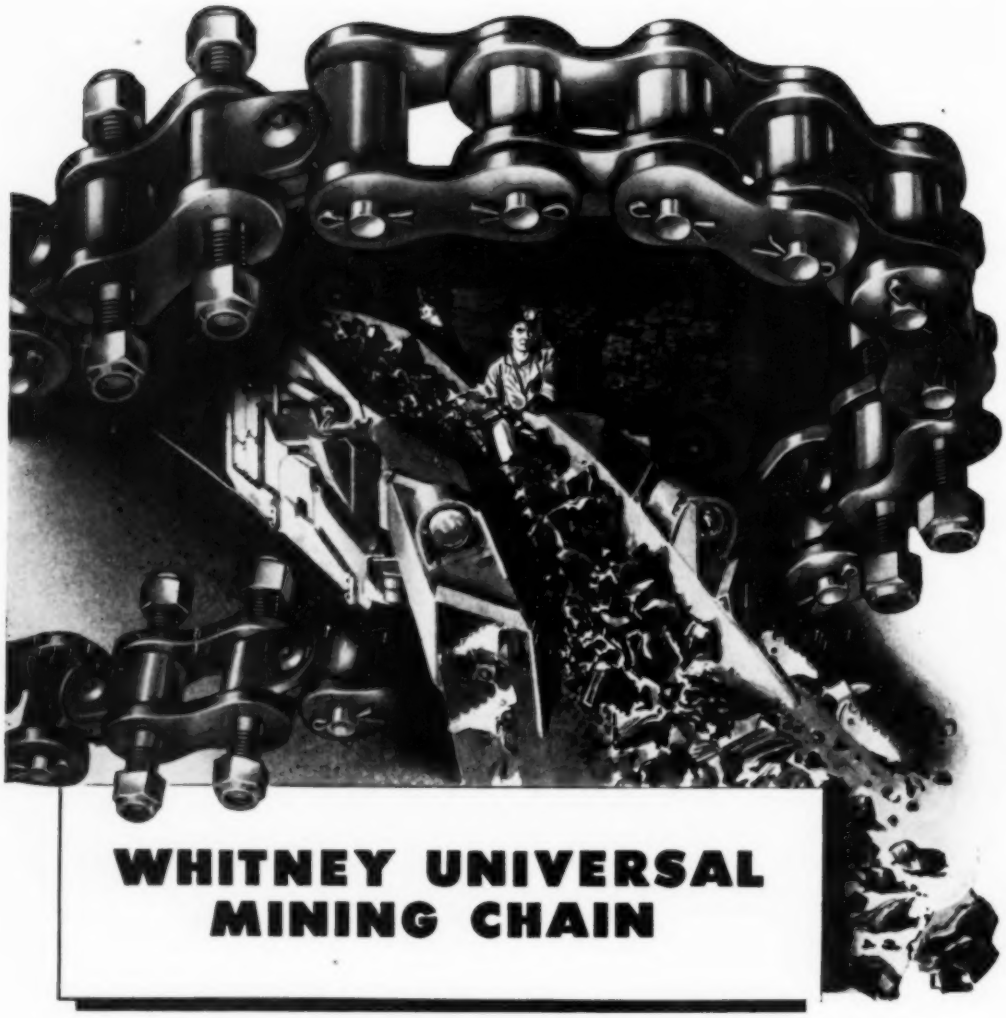
Factors determining which of these non-explosive mining methods will prove most efficient and economical in a particular mine may require a thorough examination of the property. Ask for a free check-up and detailed recommendations on the method best suited to your coal and conditions.

COAL RECOVERY DRILL

The Cardox-Hardsocg "Coal Recovery Drill" makes it possible to salvage profitable tonnage in operations at which overburden removal has become too costly for further stripping. The specially designed augers, which are available in diameters ranging from 20" to 30", carry the coal in a continuous stream from the seam. At the operation shown in the left-hand picture, the coal as it is drilled from the seam is automatically loaded into trucks by means of a portable conveyor. Write today for full particulars on the records of profitable coal recovery by this low-cost method after stripping has become too costly.

BELL BUILDING • CHICAGO 1, ILLINOIS





WHITNEY UNIVERSAL MINING CHAIN

Stays in Service Underground . . . Longer!

You simply can't beat Whitney Universal Mining Chain for dependable performance and longer life under the tough, rigorous conditions encountered in mining operations.

Used as original equipment or as replacement in loaders, this rugged chain keeps equipment producing continuous tonnage. Hardened alloy steel link parts, machined flight threads and heavy, heat treated universal joints assure long life under the severest operating conditions. It keeps equipment up "at-the face" working full schedules that pay off in tonnage and profits.

Remember, too, Whitney Roller and Silent Chains, for all-round service in equipment above or below the ground, helps you increase profits by giving maximum performance and cutting chain maintenance costs. And for over-all drive efficiency, include Whitney Cut Tooth Sprockets in your replacement jobs. Write for complete information, today.

WHITNEY CHAIN & MFG. CO.

Division of Whitney-Hanson Industries, Inc.

210 HAMILTON STREET, HARTFORD 2, CONN.

You make a three-way saving with

Gulf Mining Machine Lubricant B

1 Lower Maintenance Costs

2 Reduced Out-of-Service Time

3 Simplified Lubricant Storage and Handling

1. Gulf Mining Machine Lubricant B eliminates lubricant throwoff and channeling, prevents the entrance of abrasive coal dust in gear cases, reduces wear, and resists the washing action of water. As a result, repair and replacement costs go down and stay down.
2. Improved lubrication with Gulf Mining Machine Lubricant B means fewer breakdowns, less time in the shop—which add up to greater tonnage.
3. With just this one lubricant — Gulf Mining Machine Lubricant B—you can do the entire lubricating job on most types of mining machines. Thus you eliminate 2 or 3 lubricants, insure less confusion at the face, prevent application mistakes.

To get the many benefits possible with this quality lubricant, and for expert help on other phases of improved lubrication, call in a Gulf Lubrication Engineer today.

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

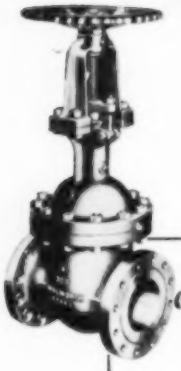
Boston · New York · Philadelphia · Pittsburgh · Atlanta
New Orleans · Houston · Louisville · Toledo

WALWORTH

Cast Steel Gate Valves

Series 150 and 300

Wedge Gate — Outside Screw and Yoke



Sectional view of Series 300

Big 8-Point Superiority!

Gland clearances are such that stem cannot be scored if gland should be tightened unevenly.

Deep Stuffing Boxes in all sizes (2″ to 24″) insure tightness and maximum packing life – costly leaks are eliminated.

Bonnets and Bodies are engineered to withstand pressure and minimize distortion – they're tough, durable, dependable.

Heavy Steel Walls provide extra strength and longer life.

Integral Body Guide Rib Faces are machined to insure accurate disc seating.

Seat Rings are bottom seated – not flange type. No recess exists at back of ring – hence no turbulence, erosion, or pressure drop.

Streamlined Ports allow high velocity, non-turbulent flow, and reduce the possibility of erosion.

Valves regularly have flanged ends. They can be supplied with ends for butt welding. Roller bearing yokes are available. On valves 5 inches and larger, by-passes can be furnished.

For Series 600 and higher, we recommend Walworth Pressure-Seal Steel Gate Valves.

For further information on Walworth Cast Steel Gate Valves, see your local Walworth distributor, or write:

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

MASTER OF MANY JOBS

Here's a unit that can do a whale of a lot of jobs around a strip mine—and do 'em all fast and at low cost. This money-maker of many uses is a husky "Caterpillar" Diesel D7 Tractor with Trackson Traxcavator with a 2-cu.-yd. bucket. On this operation for the McCullough Industries near Birmingham, Ala., it is loading out 900 tons of coal per day. And it can turn its hand to scores of other jobs, among them—stripping overburden, building roads and pushing trucks.

Hard workers that have the guts to stand the day-in-and-out gaff of strip mining—that's "Caterpillar" equipment. And the well-equipped "Caterpillar" dealer near you has a well-earned reputation for prompt, reliable service. Get the facts about the "big yellow machines" from him today!

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

• Only "Caterpillar" has final drive bellows seals. The bellows section is made of copper, and spring pressure forces the sealing surface against a chromium-plated washer. By keeping grit and sand out—and oil in—these seals protect the tractor's vital insides.

CATERPILLAR

REG. U. S. PAT. OFF.

WHEN YOU THINK OF STRIP MINING
THINK OF THE BIG YELLOW MACHINES
THAT DO SCORES OF JOBS BEST

DIESEL ENGINES
TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

NO CABLE LIKE IT!

SECURITYFLEX

PARALLEL MINE CABLE

with BREAKER-STRIP*

SECURITYFLEX *Safety Firsts*

- *First* to comply with U. S. Bureau of Mines Flame Test and Pennsylvania Flame Test. (Insist on mark of *full compliance*—P-102-BM—at 12' intervals.)
- *First* and *only* Anti-Short Breaker Strip* construction — cuts short circuits between conductors.
- *First* parallel mine cable with ground wire.
- *First* and *only* D-Shaped* insulation — prevents overriding of conductors.
- *First* to have insulation and outer jacket bonded together — to form a *solid block* around conductors.
- *First* with smaller diameters that pack more on a reel, ease handling.

*Reg. U. S. Pat. Off.

THE PATENTED anti-short breaker-strip construction of Securityflex Parallel Mine Cable is an exclusive development of Anaconda Wire & Cable Company. No other mine cable gives you this protection against shorts between conductors, even under the heaviest impact.

Breaker-Strip (available with or without ground wire) is only one of the many Securityflex features. Add up the advantages of Anaconda's specially compounded, extra tough neoprene jacket . . . non-kinking construction . . . improved heat-resisting synthetic rubber insulation . . . superior manufacturing techniques . . . the *Safety Firsts*.

Call your local Anaconda distributor (located in all principal cities) about Securityflex—the cable that takes a beating *and likes it!* Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

ANACONDA *Securityflex* **MINE CABLE** ANACONDA

Here is Plain PROOF...

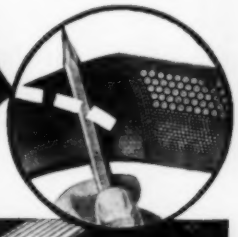
You can actually *feel* the sides of a belt *change shape* as the belt bends.

That the

CONCAVE SIDE

(U. S. Patent No. 1813698)

SAVES Transmission DOLLARS



When a *straight-sided* V-Belt bends around a pulley, three things are bound to happen.

(1) The top of the belt, being under tension, *narrows.* (2) The body of the belt, under compression, *widens.* (3) The sides of the belt *bulge out.*

These *shape changes* are inevitable. They are shown in figures 1 and 1-A, below.

Straight-Sided V-Belt.

How Straight-Sided V-Belt Bulges In Sheave-Groove.

Because this bulging belt does not fit the sheave groove, two facts become clear. (1) The belt will get excessive wear where it bulges—*shorter life!* (2) The whole side of the belt cannot *uniformly* grip the pulley—*a loss in drive efficiency.*

How different the V-Belt with the precisely engineered *concave* side (U.S. Patent No. 1813698)—the Gates Vulco Rope. As this belt bends it assumes a shape that *exactly* fits the sheave groove. (Figures 2 and 2-A, below.)

Gates Vulco Rope with Concave Side.

No Side Bulge. Precise Fit In Sheave-Groove.

Two savings result. (1) The Gates Vulco Rope wears evenly—*longer life!* It's entire side-wall grips the pulley—no slip—*full delivery of power!*

The Mark of SPECIALIZED Research

The Concave Side is MORE IMPORTANT NOW Than Ever Before

Because the sides of a V-Belt are what actually drive the pulley it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley directly through the belt's sidewalls.

Now that Gates *SPECIALIZED* Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side is naturally more important in conserving belt life today than ever before.

418

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

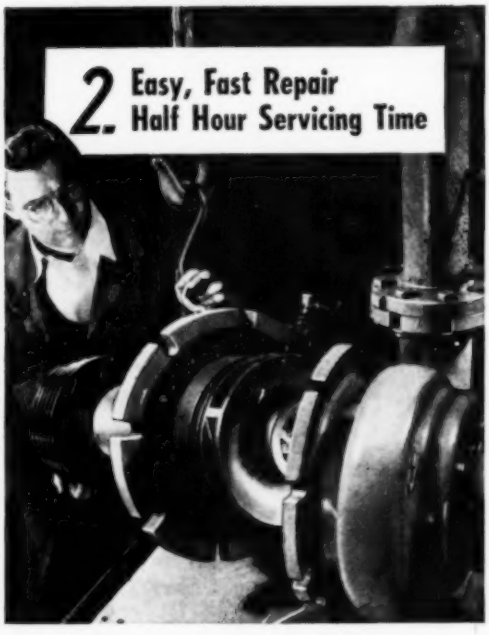
THE GATES RUBBER COMPANY

DENVER, U.S.A.

"The World's Largest Makers of V-Belts"

Save 2 Ways

With Allis-Chalmers Coal Washing Pumps!



THIS IS WHAT TYPICAL COAL OPERATORS say about Allis-Chalmers coal washing pumps:

"In ten months this pump has run without replacement of a single part. Only maintenance has been inspection and lubrication."
"Have just replaced impeller after nine months of two and three shift service."
"Pumping slurry from drier to settling basin, 50% solids. Delivers full capacity after 8 months service."

Here is proof that Allis-Chalmers coal washing pumps *actually deliver* the long service promised for them; proof that they actually do cut pumping costs.

SAVES ON UPKEEP, TOO

Every coal washing pump, regardless of type, requires regular replacement of wearing parts. The Allis-Chalmers coal washing pump makes this job easy, fast and economical.

Dismantling and reassembling takes a half hour or less. Wearing parts are separated and only worn parts need be replaced. Three sets of bearings, brackets and shafts cover all pump sizes, reducing inventory of parts as much as 2/3.

EXPERT APPLICATION ENGINEERING

When you buy, a skilled pump application engineer makes sure you have the *right* pump for your needs. Contact nearest A-C sales Office or write for Bulletin 6381.

A-2763

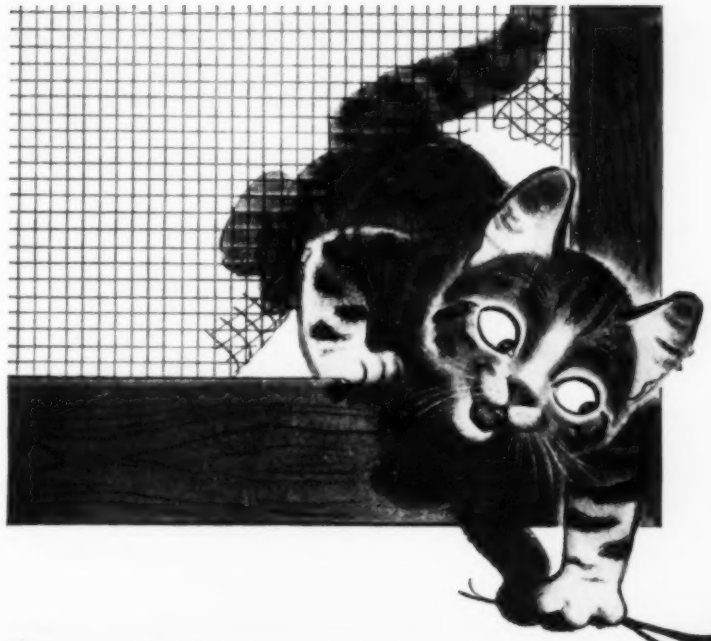
ONLY FIVE WEARING PARTS

Shaft sleeve, impeller, casing, two wear plates. All easy to handle and easy to replace.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS, 968A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS



*PENETRATION

Peak production . . . without worry of breakdown due to friction and wear . . . is made easier with Tycol high quality greases.

Made to "absorb punishment" without thinning down and dripping, Tycol greases avoid wasted lubricant, lost bearings and unnecessary down-time. These ultra-safe lubricants keep bearings . . . gears . . . shafts . . . friction-free and cool. They are available in grades with the proper "*PENETRATION" needed to give power a chance to produce with a minimum of waste.

Call your nearest Tide Water Associated office. Let them suggest the Tycol grease best suited to your needs . . . and remember, Tycol green cast greases are made from high quality cylinder stock and well refined neutral oil, with a minimum of soap — a maximum of oil . . . more efficient lubrication per pound of grease.

TYCOL

INDUSTRIAL LUBRICANTS

Boston • Charlotte, N. C. • Pittsburgh • Philadelphia • Chicago Detroit • Tulsa • Cleveland San Francisco • Toronto, Canada

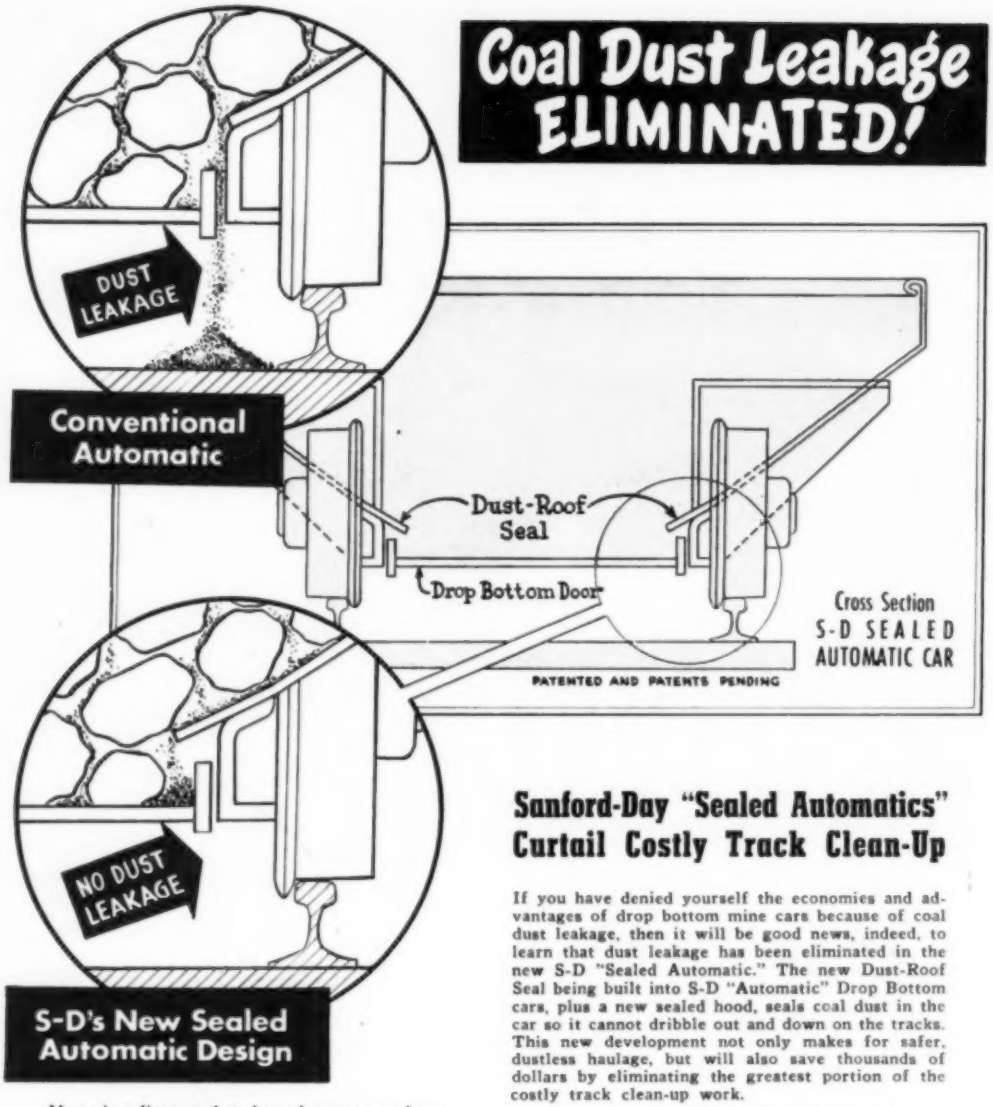
TIDE WATER ASSOCIATED OIL COMPANY

17 BATTERY PLACE · NEW YORK 4, N.Y.

*LEARN WHAT THIS PRODUCT CHARACTERISTIC MEANS TO YOU — READ "LUBRICANIA" This informative handbook, "Tide Water Associated Lubricania," gives clear, concise descriptions of the basic tests used to determine important properties of oils and greases. For your free copy, write to Tide Water Associated Oil Company, 17 Battery Place, New York 4, N. Y.

REFINERS AND MARKETERS OF VEEDOL — THE WORLD'S MOST FAMOUS MOTOR OIL

Coal Dust Leakage ELIMINATED!



Above is a diagram that shows how you can keep dust off your tracks with the S-D "Sealed Automatic." In the circle at top left is shown the conventional drop bottom construction and how dust shakes down and out through the necessary clearance space between the door and the car frame. The lower circle shows how the new Dust-Roof Seal carries sifting dust across the open space, providing a 100% effective dust seal.

Sanford-Day "Sealed Automatics" Curtail Costly Track Clean-Up

If you have denied yourself the economies and advantages of drop bottom mine cars because of coal dust leakage, then it will be good news, indeed, to learn that dust leakage has been eliminated in the new S-D "Sealed Automatic." The new Dust-Roof Seal being built into S-D "Automatic" Drop Bottom cars, plus a new sealed hood, seals coal dust in the car so it cannot dribble out and down on the tracks. This new development not only makes for safer, dustless haulage, but will also save thousands of dollars by eliminating the greatest portion of the costly track clean-up work.

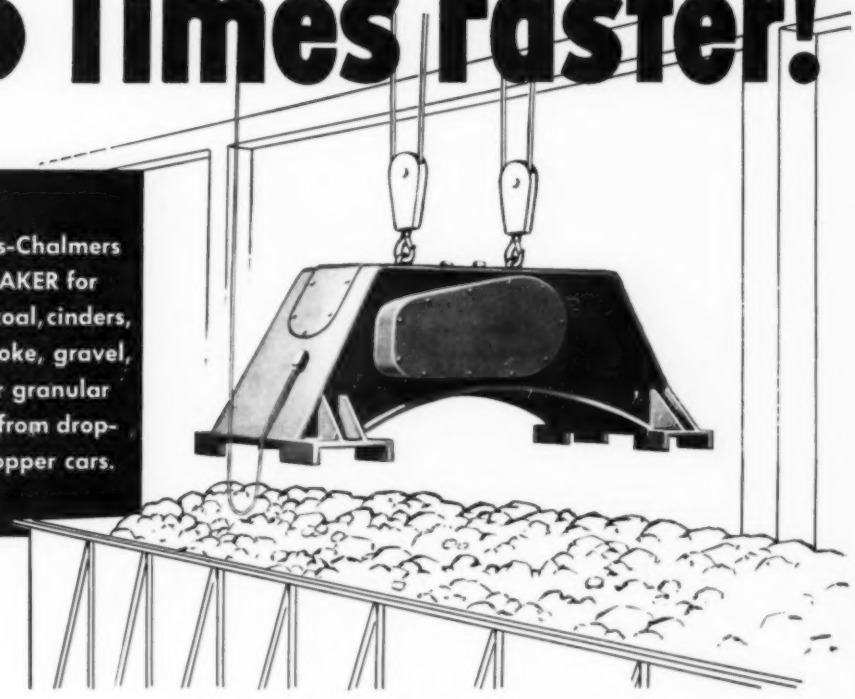
Always a leader in the field, S-D "Automatics" are now better than ever. You still get the same big capacity and automatic unloading. You still get the improved long-life construction, and foolproof "Jerk-out" unlatching device that operates underneath S-D "Automatic" cars. Now, with this revolutionary, money-making SEALED construction, you get the most efficient car the industry has ever known.

20 Car loads of "Automatics" from—

SANFORD-DAY IRON WORKS, Inc. Knoxville 9, Tenn.

Now! Unload Coal 15 Times Faster!

New! Allis-Chalmers CAR SHAKER for unloading coal, cinders, ore, slag, coke, gravel, and other granular materials from drop-bottom hopper cars.



A TYPICAL EXAMPLE: In as little as two minutes a gondola car of 1¼ x 0 in coal screenings can be unloaded with the new Allis-Chalmers Car Shaker. Manual unloading of the same car would take up to 30 minutes!

And you save on safety! Accidents are eliminated as workmen do not have to mount the car during the automatic unloading operation. Vibratory motion of the Shaker is transmitted to the car and loosens bridged granular material so it flows freely through the hopper openings.

The Shaker is driven by a 15 hp, high torque, integrally enclosed Allis-Chalmers motor — mounted on rubber to protect motor from severe vibration.

For complete information on how this new Car Shaker can help *you* save time and money, contact your nearby A-C Sales Office. Or send in the handy coupon below.

CHECK THESE SIX MONEY AND LABOR SAVING FEATURES!

1. Motor is located inside body; drive completely covered by guard.
2. Size of body and shoes designed to fit all hopper cars operating on the North American continent.
3. Simplified mechanism reduces number of working parts.
4. Hydraulic arrangement for bearing removal.
5. Car Shaker heavily designed—Stress relieved after welding and before machining.
6. Shaker is well balanced for ease in handling by crane or hoist.

A-2748

ALLIS-CHALMERS, 968A SO. 70 ST. MILWAUKEE, WIS.

Please send Car Shaker Bulletin 07B7221.

Name.....

Title.....

Firm.....

Address.....

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

Truax-Traer Coal Company Preparation Plant located on the Ohio River at Ceredo, West Virginia

Huge Central Cleaning Plant

up-grades coal to metallurgical quality

You are looking at a central coal-cleaning plant which is located at some distance from the several mines where the coal is mined.

Run-of-mine coal from these mines converges here and is processed into uniform metallurgical coal for coking purposes and also steam coals for domestic uses. These coals are automatically loaded on river barges for delivery to steel mills and on rail cars for delivery to inland users.

This plant processes 800 tons per hour. It is the fourth and largest coal preparation plant of Truax-Traer, embodying the new idea of a central cleaning plant to mass process the output of a number of mines.

There are many new laborsaving, profit-increasing features about this plant which our technical staff will be glad to explain to you.

NOTE: Please forgive us when we ask you to swing the book sufficiently to see and read about this huge plant. Coal preparation plants have grown to such mammoth proportions these days that a page is hardly large enough to illustrate them adequately.

. . . *A Huge Plant, Indeed*

but it responds instantly to push-button control

The entire processing operation is automatic. All units are synchronized and under the direction of operators at centralized control panels.

Coal is unloaded from incoming cars in an automatic dump. Run-of-mine travels by conveyor to primary breakers. Thence to washing plant where coal is washed, screened, sized, blended, and dried. The plant's product comes forth as the result of predetermined planning to produce steam and metallurgical coals required to meet customers' specifications.

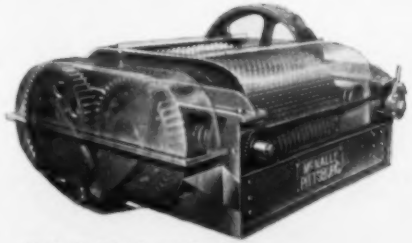
The accomplishments of a plant like this far exceed the expectations of most operating men. It is so completely automatic that it carries on with scarcely the aid of a human hand.

Some of the units of equipment in this highly mechanized plant are illustrated below and are available individually to assist you in up-grading your products.

McNALLY PITTSBURG
MANUFACTURERS OF EQUIPMENT TO MAKE COAL A BETTER FUEL

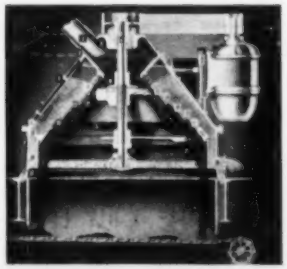
McNally Pittsburg Manufacturing Corporation—*Manufacturing Plants:* Pittsburg, Kansas • Wellston, Ohio

Engineering & Sales Offices: Pittsburgh • Chicago • Rio de Janeiro • Pittsburg, Kansas • Wellston, Ohio



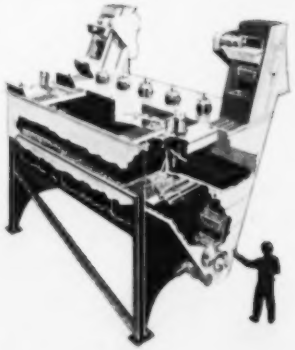
McNally Pittsburg Crushers

The latest model Gearmatic Crusher for economical reduction to screenings or stoker sizes. Light, Standard, Heavy-Duty Stoker Coal Crushers; seven sizes. Reduce egg and nut sizes to 1¼", 1", or ¾". Also Heavy and Standard Double-Roll Gearmatic Primary Breakers are available.



McNally-Carpenter Dryer

Flexible centrifugal dryer for high water removal; small loss of product in the effluent; large capacity; low power cost per ton of dried material; low maintenance cost. Especially efficient in minus ⅜" sizes. As material passes over stepped-truncated drying cone into discharge hopper, it is thoroughly dried to the desired moisture percentages.

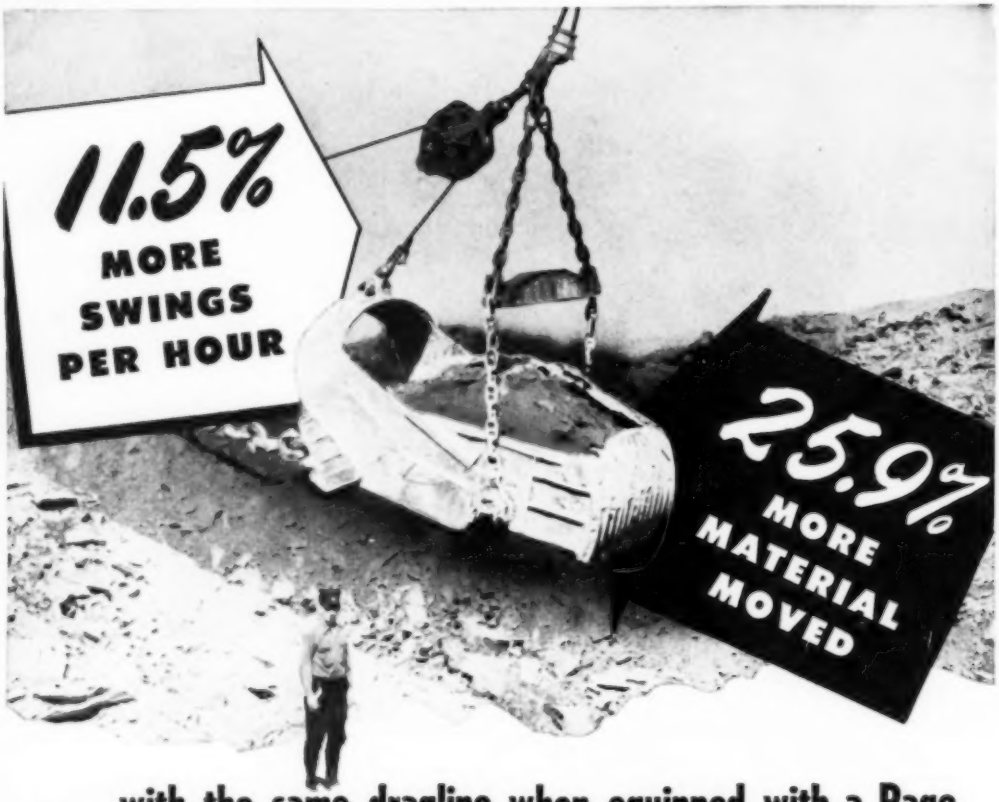


McNally-Norton Washer

Fully automatic washer of Baum jig type gives positive separation of coal from non-combustible refuse. Simplified operating control. Washes sizes to 8", obtaining maximum coal recovery. Low power consumption requires no constant attendant. Specific gravity of washed coal adjustable to predetermined market requirements. Available in models from 25 to 350 tph per unit.

McNally Screening Equipment

Efficient and economical multiple screening sections are combined with means for by-passing to lower decks for re-screening and by-product handling at a low operating cost. Illustration shows a multiple-deck classifying screen. Gates are provided at the head of each chute. By closing the proper gates, any mix of sizes may be obtained or mine run loaded over the lump boom by closing all the gates and without veiling the screen.



. . . with the same dragline when equipped with a Page AUTOMATIC

Rated capacity cu. yds.	No. of 24-hour days in use	No. of bucket loads in period worked	User's Engr's estimate of cu. yds. per bucket load	Total cu. yds. excavated in period worked	Cu. yds. excavated in 24-hour day	Average number of bucket loads per hour
25 Cu. Yd. Competing Bucket	15 consecutive days	19,685*	20.2	397,637	26,509	54.68
25 Cu. Yd. Page Automatic	16 consecutive days	23,424*	22.8	534,067	33,373	61.0

*Recorded by Esterline-Angus

On an actual 16 consecutive day run with all conditions alike — the same dragline, the same operators and the same material, a 25 cu. yd. Page AUTOMATIC Dragline Bucket outperformed a competitive bucket of the same rated size by a wide margin. The table gives all the facts found by a well-known coal company which made the test to determine the best bucket for their own stripping operations.

Assuming that both buckets carried equal loads, the Page AUTOMATIC made 11.5% more swings per hour. Considering both the increased number of swings and larger loads, the Page AUTOMATIC moved 25.9% more material than the competing bucket.

The extra bucket loads were obtained by the AUTOMATIC because of its quick loading features. Generally, little more than two lengths of the bucket are required to pick up a full load.

The increased yardage moved with the AUTOMATIC was due to its ability to obtain full loads on every trip while the competing bucket did not load the back end once out of ten times.

No effort was made during the test to determine the amount of dragline pull necessary to operate either bucket. However, other installations have proved that a Page AUTOMATIC requires up to 25% less dragline pull than the usual old style bucket.

Whether you need a small bucket or a big one, you can always move more yardage at less cost with a Page AUTOMATIC.

PAGE ENGINEERING COMPANY, Clearing Post Office, Chicago, Illinois

SPECIFY

Rome 60

NEOPRENE SHEATHED

DRILL CORD

FOR ECONOMY

THROUGH LONG LIFE

Rome 60 Drill Cords last longer . . . keep replacement costs to a minimum . . . because these cords are specially made for rough mine service. Here's how:

1. *Maximum, non-kinking flexibility* assured by precise stranding of fine copper wires.
2. *Heat-resistant, long-aged insulation* specially compounded for high electrical stability and quality performance.
3. *Resistance to mechanical shock* provided by longitudinal fillers, reinforced for resiliency and protection against crushing and tensional strain.
4. *Resistance to oils, acids, moisture and flame* from the all-resistant, long-wearing Neoprene sheath.
5. *Long service life* because the Neoprene sheath is cured to produce a durable tire-like resistance to abrasion and hard use.

For SAFETY...

APPRO. P-105 molded in the sheath signifies strict compliance with State of Penn. flame test requirements.

Three conductor construction assures adequate grounding in accordance with Federal Bureau of Mines, Schedule 2E.

IT COSTS NO MORE TO BUY THE BEST . . . **SPECIFY ROME 60**

FROM BAR TO FINISHED WIRE

ROME CABLE CORPORATION

ROME • NEW YORK

P-G *Nonbreakable* STEEL GRID RESISTORS

for any job...

WHERE CONSTANT "TROUBLE-FREE" RESISTOR SERVICE IS ESSENTIAL!

P-G "Type T2" Steel Grid Resistors are designed for heavy duty applications in Mines, Steel Mills, Railroad Shops and any other usage where the electrical equipment may be subject to severe service. Built entirely of steel and mica, there is nothing to break. They are sturdy, light in weight and stand up well under occasional overload. Resistance values of P-G Resistors remain remarkably constant, regardless of temperature or age.

Give us your specifications...

A P-G engineer can help solve your Resistor problem.

P-G

The Nonbreakable Steel Grid Resistor

THE POST-GLOVER ELECTRIC COMPANY

• ESTABLISHED 1892 •

221 WEST THIRD STREET, CINCINNATI 2, OHIO

Manhattan Belting Engineers set out specifically to solve the problem of lowering conveyor belt maintenance costs. They designed a belt that troughs easier in the idlers; a belt that cushions impact of heavy shock loads with a rebounding quality that means longer belt life.

The new conveyor belt was named HOMOCORD, a homogeneous rubber-and-cord construction that soon inspired the term, "Rippling Muscles". It flexes and absorbs the terrific punishment of long mine loads like the muscles of a mighty wrestler's back. Homocord construction is made *only* by Manhattan and designed *only* for conveyor belt use.

If you haven't "discovered" Homocord, be sure to ask for a demonstration of its cost saving advantages in your mining operations.

RAY-MAN RAYON CORD "TENSION MASTER"
For longer lifts requiring fewer transfer points . . . another Manhattan Conveyor Belt Development.

Keep Ahead with Manhattan

Complete Line for Mines

Hose, Transmission Belting, Trolley Wire Guard and Other Rubber Products Engineered by Manhattan with 56 Years of Leadership in Service to Mining

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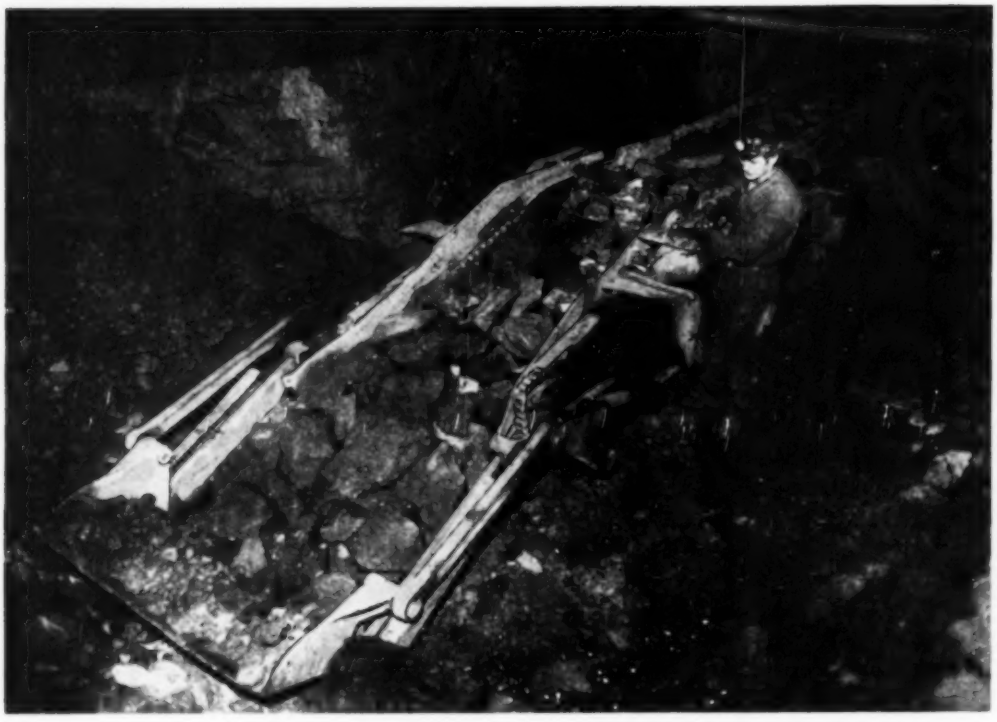
RAYBESTOS-MANHATTAN INC.

MECHANICAL RUBBER PRODUCTS — RUBBER COVERED EQUIPMENT — FRICTION MATERIAL — ASBESTOS TEXTILES
PACKINGS — POWDERED METAL PRODUCTS — ABRASIVE & DIAMOND WHEELS — BOWLING BALLS

MANHATTAN RUBBER DIVISION **PASSAIC, NEW JERSEY**

For Consistent Rapid Loading In Rock Work At Lowest Cost, You Need The Whaley "Automat"



That loader you see above "digging-in" and loading rock is the shovel-action Whaley "Automat," the mining industry's most dependable rock loading machine. It is working in a 14 ft. entry where coal is approximately 36" thick (Pocahontas No. 4 seam) and approximately 3 ft. of rock is taken to increase height of haulage ways.

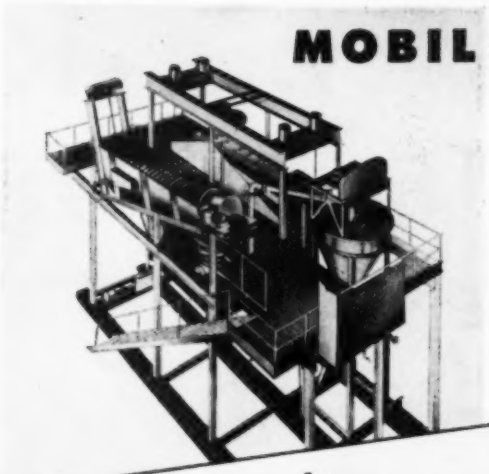
For more than 3 decades the Myers-Whaley Shoveling Machine has been recognized as one of the industry's most efficient loaders for coal and the only machine that can continuously take the punching of rock loading at normal maintenance cost. It is preferred by operators everywhere because it is always safe in narrow places . . . because it uses only 1/5 K.W.H. per ton of material loaded . . . because it is equally effective in loading coal or rock . . . because it is the only mechanical loader that has the automatic Parallel-to-track Rear Conveyor . . . because its exclusive shovel-action loading head produces results obtained by no other loader. If Rock or Slate is your loading problem, the "Automat" is a must, yet it is always ready for coal. Myers-Whaley Co., Knoxville, Tenn.

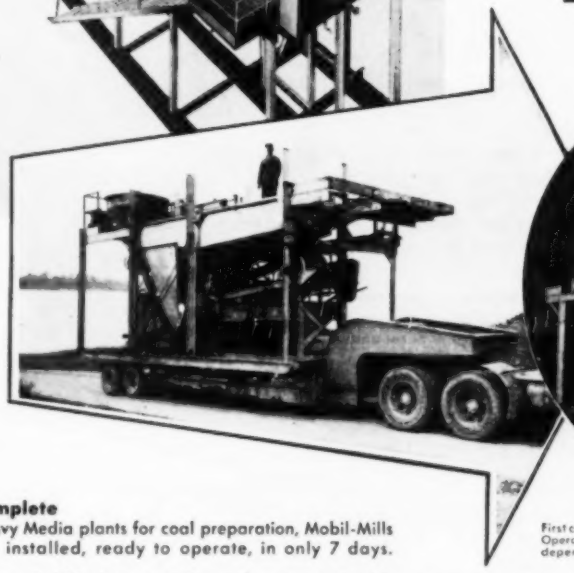
Myers Whaley

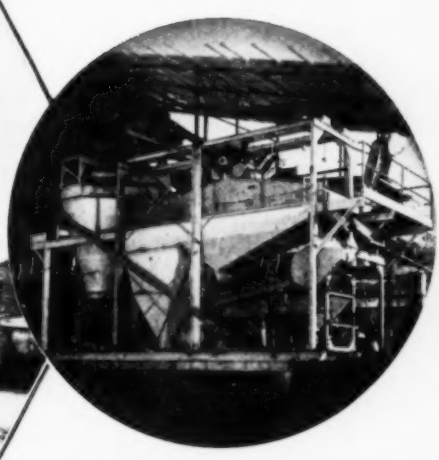
"Mechanical Loaders Exclusively for Over 40 Years"

MOBIL-MILLS FOR COAL CLEANING

READY TO OPERATE IN 7 DAYS!







First costs of the Mobil-Mill are as low as $30.00 per ton capacity. Operating costs range from only a few cents to 25¢ per ton feed, depending on type of ore and local operating conditions.

Complete
Heavy Media plants for coal preparation, Mobil-Mills are installed, ready to operate, in only 7 days.

- Easy, field-bolting installation by crew. WEMCO field engineers will assist you at no extra charge.
- Immediate delivery on some sizes—3 to 6 weeks on others.
- Rent or buy in 5 sizes: 25 • 35 • 60 • 125 and 250 TPH feed.
- Compact, semi-portable, easy to operate.
- Sharp separations for clean coal production.

More than 10 MILLION TONS PER YEAR (rated capacity) are being handled by WKE (HMS) Mobil-Mills. For coal preparation Mobil-Mill users include:

BELLE VALLEY COAL CO.
CHARLES E. CAMPBELL
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MID-CONTINENT COAL CO.
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SIMPSON CREEK COLLIERIES CO., INC.

Write today for detailed information about Mobil-Mills and other WEMCO equipment for coal preparation.

PRINCIPAL OFFICES
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WKE (HMS) Mobil-Mill • Coal Spiral • Standard Thickeners (HMS) Thickeners • (HMS) Media Pumps • Hydroseparators (HMS) Densifiers • (HMS) Separatory Cones • "SH" Classifiers Sand Pumps • Conditioner and Agitators • Fagergren Flotation Machines • Dewatering Spirals • (HMS) Laboratory Units

8 A.M. EFFICIENCY

maintained **ALL DAY** with **ORTON**

ONE-MAN

AERO-CRANE

POWERMATIC AIR-CONTROL

No Afternoon Fatigue Let-Down

One Man, with the Powermatic Air-Control Orton Aero-Crane loads and unloads cars, trucks, gets material onto the stockpile and off with *early-morning* efficiency *all day.*

Effortless Orton air-control enables one man with the Aero-Crane to handle 200 to 1000 lb. loads that eat up the time of a yard crew. Aero-Crane pays for itself in saved man hours.

Designed to SPEED Yard Work

Orton one-man Aero-Crane travels rapidly job to job with boom in any position.

Insures SAFE lowering of heavy loads against *compression of the engine.*

Full-view cab. Full circle turntable. Anti-friction bearings. Non-burn Orcoin V-type clutches. SAFETY spring-applied, air-released hoist brakes. Electro-welded construction.

Eight models, 3,500 to 60,000 lbs. capacity. Diesel or gasoline powered.

Send for Catalog 73-B for full details and roster of Orton world-wide users

◄ Long-life Orton Aero-Crane has most rigid car body of any crane built. Goes anywhere a truck will go. Operated, traveled and steered from craneman's seat.

ORTON CRANE & SHOVEL COMPANY

608 South Dearborn Street, Chicago 5, Illinois

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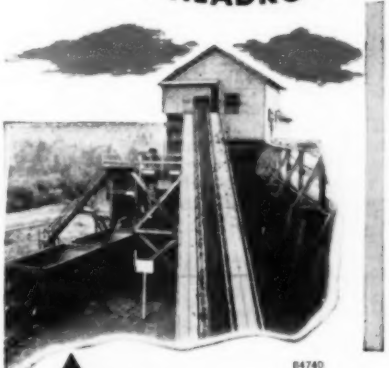
LOW HEADROOM..HIGH EFFICIENCY CONVEYORS...

Standardized

for easy assembly and relocation



84740

You can cut the cost of getting the coal out of those low seams with simplified, "standardized" B-G channel-frame belt conveyors. These B-G *pre-engineered* underground conveyors come to you clearly marked for quick and easy assembly—are simply disassembled, relocated with a minimum loss of working time. Rugged channel frame has skid legs for low head room mounting on the floor, holds smooth rolling B-G Carriers in true alignment . . . To cut costs now, why not see your B-G Distributor about these widely used mine conveyors?

(Left) Less assembly time, less "blueprint work"—B-G Mine Conveyors (Channel or Truss Frame) with complete accessories—carriers, take-ups, drives, A-frames, etc.—are designed for maximum interchangeability, greatest ease in selection and erection. Assembly-tested at the factory!

BARBER · GREENE COMPANY AURORA, ILLINOIS

Constant flow Equipment

LOADERS | PERMANENT CONVEYORS | PORTABLE CONVEYORS | COAL MACHINES | BITUMINOUS PLANTS | FINISHERS | DITCHERS

All across the country . . .

wherever coal is prepared . . . there is

ONE SURE SIGN OF SUCCESS:

Engineered by RandS

D J. B Collieries, Flanory, Kentucky

Feds Creek Coal Co., Biggs, Kentucky

YOU FIND THE WORDS, *Engineered by RandS*, in use wherever coal is prepared, in every major coal producing area of the country. And, invariably, the preparation plants to which those words apply are the acme of functional design and operating efficiency. These plants do the job they were intended to do . . . dependably . . . to their owners' satisfaction and profit. That's why "Engineered by *RandS*" has become the traditional sign of successful coal preparation plants.

Typical of *RandS*-Engineered plants around the country are the two Eastern Kentucky plants pictured here. Into their design went consideration of all important factors: nature of the raw coal, desired end products, characteristics of plant site, and available shipping facilities. Into their construction went the best possible workmanship and materials . . . and the 40-year-old Roberts and Schaefer Company tradition of *doing things right*.

Additional washing equipment now being installed in these plants by *RandS* engineers will keep them, as *always*, ready to meet and exceed the demands of competition by preparing uniform, premium-quality coal in even greater quantity.

How does your plant measure up by competitive standards? Are you selling to a limited market because the facilities of your plant will not permit you to do otherwise? Is your coal selling at regular prices while your competitors are getting premium-coal prices? These fundamental questions are worth thinking about, worth talking about—and *RandS* engineers are good men to talk to about them. Your inquiry is invited.

A short note on your company letterhead reserves for you a copy of the 20-page book, PREPARE FOR PROFIT. It contains factual stories of how other plants are solving their preparation problems the *RandS* way. Write today—a copy will be yours as soon as it comes off the press.

ROBERTS and SCHAEFER CO.

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2801 Broadway Ave. PITTSBURGH 16, PA.

P. O. Box 570 HUNTINGTON 10, W. VA.

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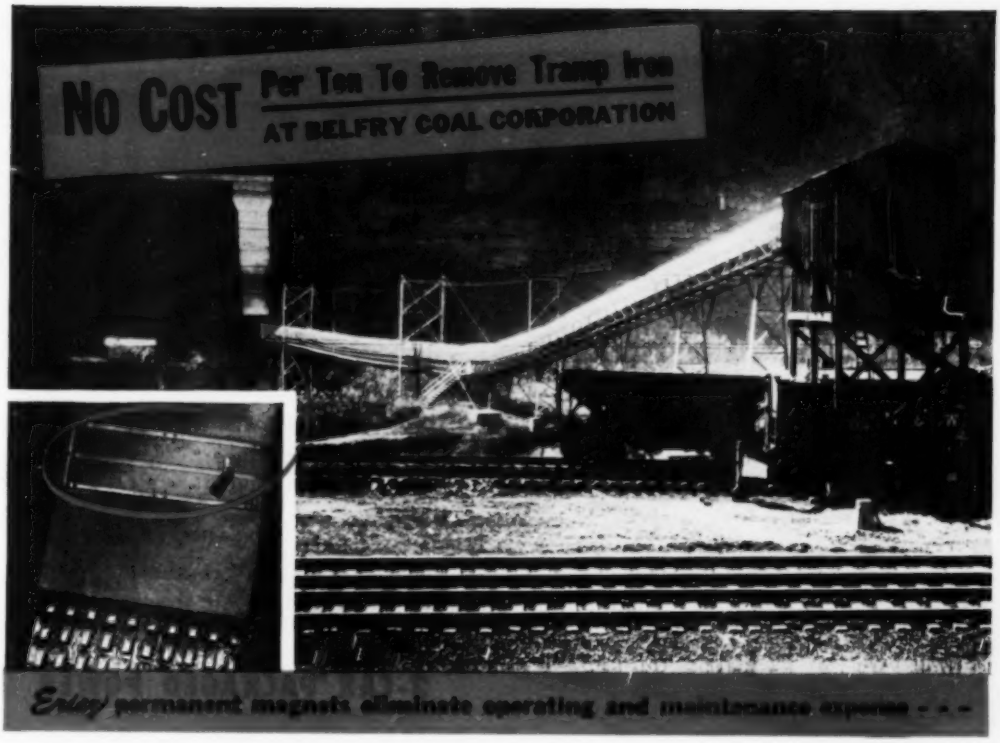
No Cost Per Ton To Remove Tramp Iron
AT BELFRY COAL CORPORATION
Eriez permanent magnets eliminate operating and maintenance expense - - -

BELFRY Coal Corporation takes tramp iron out of their coal for nothing by installing Eriez Permanent Non-Electric Giant Plate Magnets in the bottom of the feed chutes. Thus they get clean, iron-free coal and also protect preparation equipment from damage by tramp iron.

How do they do it for nothing? First, the low installation cost of Eriez Permanent Non-Electric Magnets is soon repaid in the savings they make in operating and maintenance expense. No electric current, no wiring, no conversion from AC to DC . . . In short, no operating nor maintenance cost whatever . . . No shutdowns due to current failure, no burn outs. Eriez Magnets are Permanent. They are on the job 24 hours daily . . . they come to you completely energized, ready for their life-long, full-strength duties. Why not call in an Eriez Permanent Magnetic Separation Engineer today? Let him recommend the correct answer to your tramp iron troubles. *And send the coupon below now for your copy of Catalog No. 12, giving full details on the complete line of Eriez Permanent Non-Electric Magnets.*

Write for new booklet—"Permanent Magnets and Metal Detectors for the Mining Industry."

Pioneer of PERMANENT Magnetic Separation

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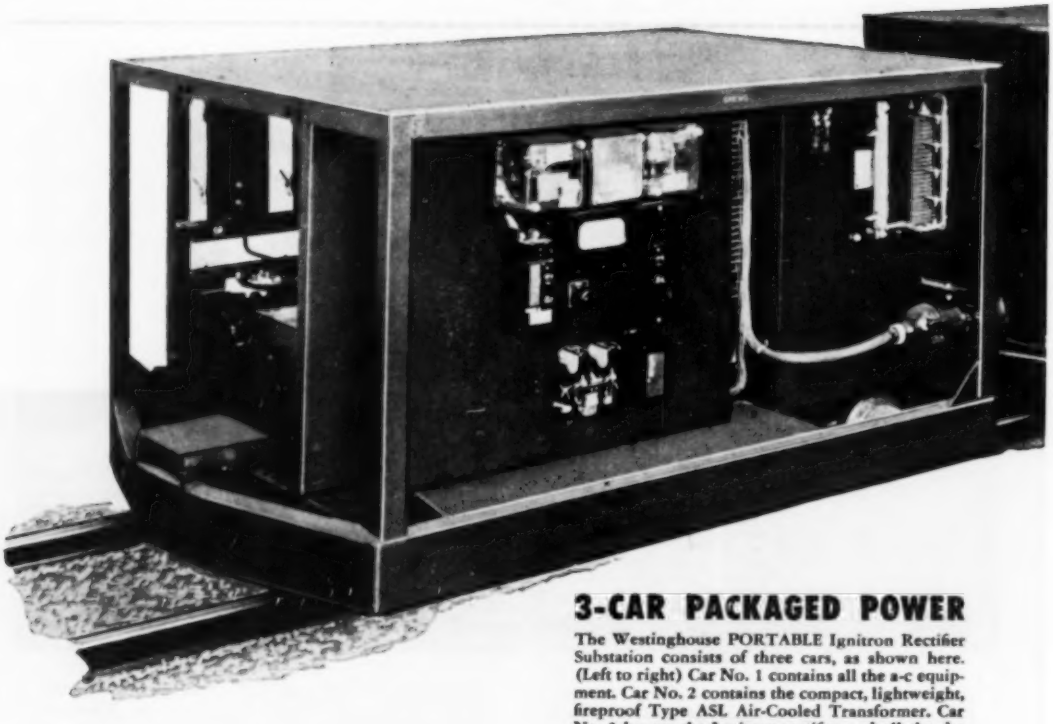
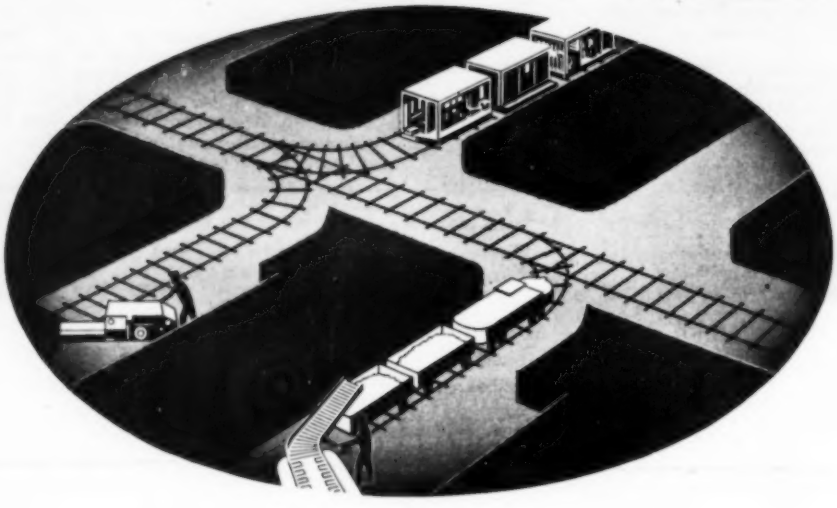
YOU CAN BE **SURE**.. IF IT'S
Westinghouse



3-CAR PACKAGED POWER

The Westinghouse PORTABLE Ignitron Rectifier Substation consists of three cars, as shown here. (Left to right) Car No. 1 contains all the a-c equipment. Car No. 2 contains the compact, lightweight, fireproof Type ASL Air-Cooled Transformer. Car No. 3 houses the Ignitron rectifier and all the d-c equipment. This arrangement makes possible a compact unit, light in weight and easy to handle.



Westinghouse Ignitron

THE HEART OF LOW-COST MINING

Working areas advance so rapidly in modern underground mining, there's only one sure way to get efficient, continuous operation of machinery at the face. That is by having co-ordinated electrical equipment to deliver ample power.

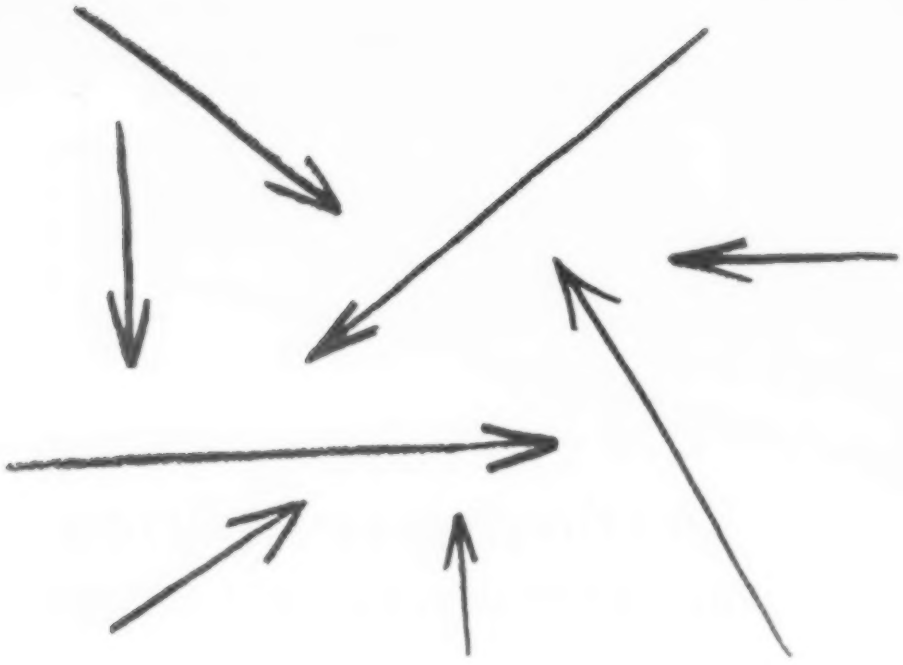
The heart of this equipment is the Westinghouse PORTABLE Ignitron Rectifier Substation. It has many advantages over conventional rotating power-conversion machines.

1. **High efficiency at all loads**—less kilowatt-hours, less power loss and lower maximum demand.
2. **Capacity for frequently repeated severe overload**—high load swings are handled readily.
3. **Reliability**—less lost time and increased production.
4. **Ease of installation**—unit is completely self-contained, requiring only connections to the power source and the load.
5. **Light weight**—easily moved to new locations. Comes with standard mine car wheels or mounted on skids for trackless mining.
6. **Reduced maintenance**—no large rotating parts; no large bearings, commutators or slip rings to replace or maintain.
7. **No surge or high inrush during starting.**
8. **Quiet operation.**
9. **Reduced fire hazard.**
10. **No danger from overspeeding.**

Westinghouse pioneered in the development of Ignitron rectifiers for mining service. Today, more Westinghouse rectifiers are in use than those of all other manufacturers combined.

If you have problems that pertain to the use of power for low-cost coal mining, whether underground or stripping, call your nearest Westinghouse District Office, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-94806

Westinghouse



They're all the same to a TIMKEN® bearing

NO MATTER from what direction the loads may come, Timken® roller bearings carry them all safely—dependably. Timken bearings are tapered in design—carry both radial loads, thrust loads and any combination of them.

With Timken bearings in your product, auxiliary thrust bearings and thrust plates are eliminated. Designs can be simplified, space saved, cost reduced.

You have a better-working product, too. The tapered construction of Timken bearings prevents end-play and holds shafts in proper alignment. Wear on surrounding parts is reduced; gears mesh more smoothly.

And Timken tapered roller bearings give you these added advantages: Due to the line contact between rolls and races, they have extra load carrying capacity. True rolling motion and smooth surface finish practically eliminate friction. Timken bearings permit the use of closures which keep lubricant in—dirt out. And since they're made of Timken fine alloy steel, Timken roller bearings normally last the life of the machine in which they are used.

Dependable performance and public acceptance of Timken bearings have made Timken-bearing-equipped products first choice throughout industry. They add a valuable sales feature in your product—build greater acceptance among customers. When you specify bearings for your product, specify "Timken". And when buying new equipment, always look for the trade-mark "Timken" on the bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

50th birthday of the company whose products you know by the trade-mark: TIMKEN

TIMKEN
TRADE MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

LOW COST PER UNIT OF WORK

Suppose you're considering two competitive brands of wire rope. They look alike, but one sells for a little less than the other. Bargain? Often it's anything but a bargain. For purchase price alone isn't the measure of wire-rope economy.

Sometimes you may find a wire rope with a lower price tag than Bethlehem's. But how does the cheaper one compare in total service rendered? How about its *Cost per Unit of Work?*

What a unit of work is depends, of course, upon the industry involved. It can be a ton of rock moved by a power shovel. Or a car of coal hauled up a slope. Or a ton-mile in oil-country rotary drilling. But in any case, unless your final rope Cost per Unit of Work is *low*, the rope has not done an economical job for you. That's why first cost—purchase price—isn't the sole yardstick.

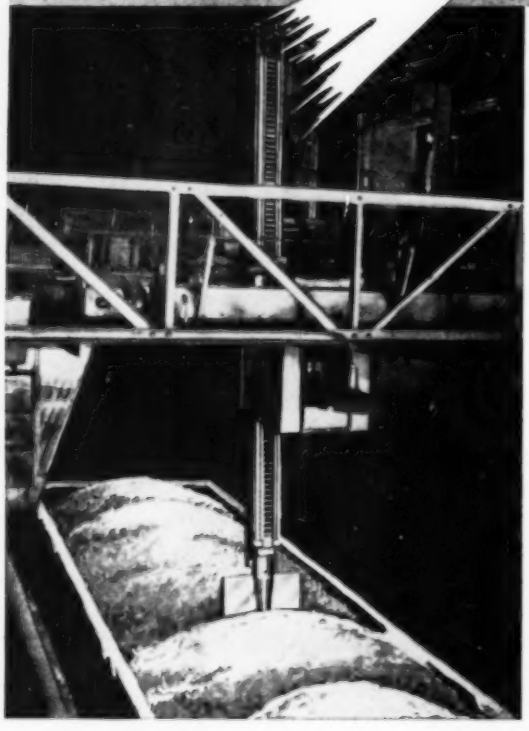
Bethlehem wire rope is a quality product, one conscientiously built for long-range economy. When you buy it, you are spending your money wisely. You are buying wire rope that means, in the truest sense, *low* Cost per Unit of Work.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

The Summer Sun is Shining Now

BUT . . . What about . . . When the "DEEP FREEZE" Arrives?



It is only a "Hop—Step—and a Jump" from Summer to Winter . . . and woe betide the men responsible for continuous plant operation if the coal is in the hopper cars . . . but not usable!

The Kinney Car Unloader, manufactured and sold only by *Heyl & Patterson,* unloads Hopper Cars of Frozen Coal without the use of heat and without damage to the cars.

The Kinney Car Unloader enables one man to unload a 70-Ton Car of Frozen Coal in 20 minutes or less.

Heyl & Patterson has Kinney Car Unloaders ready now for installation early in the Fall in time to serve your Hopper Car Unloading Needs this coming Winter.

ORDER YOUR H+P KINNEY CAR UNLOADER NOW!

Ask an H+P Engineer to Consult With You

Ore Bridges
Railroad Car Dumpers
High Lift-Turnover-Rotary
Coal Preparation Plants
Coal & Coke Handling Equipment
Boat Loaders and Unloaders
Rotary Mine Car Dumpers
Coal Crushers
Coal Storage Bridges
Car Hauls & Boat Movers
Bradford Breakers
Refuse Disposal Cars
Thorsten Coal Samplers
Kinney Car Unloaders
Pig Iron Casting Machines

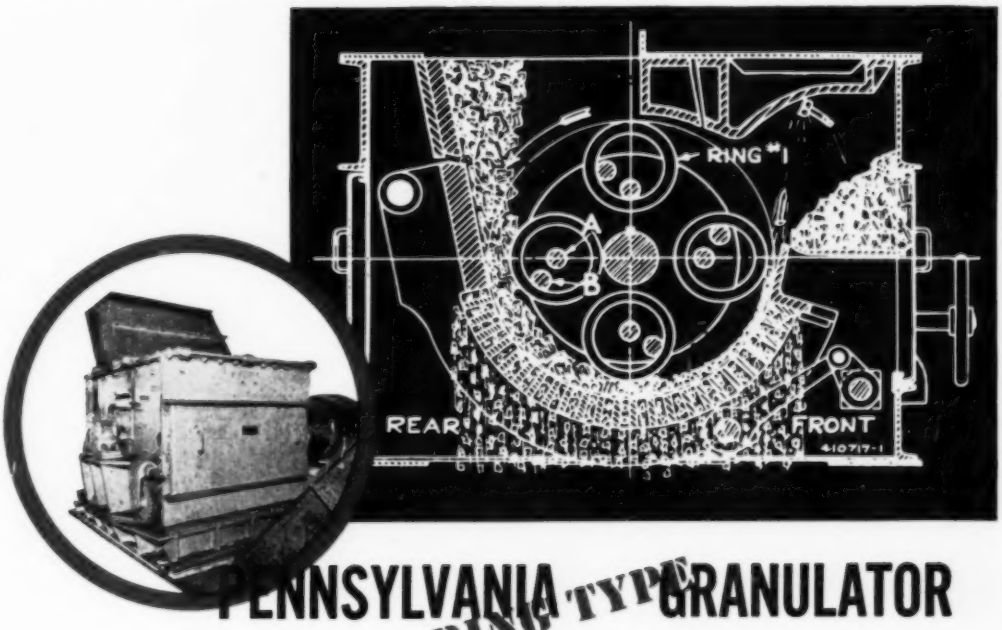
Heyl+Patterson, Inc.

"SINCE 1887"

55 WATER STREET · PITTSBURGH 22, PA

LESS OVERGRINDING, MORE GRANULATION

because the *RING GETS PUSHED*



PENNSYLVANIA RING TYPE GRANULATOR

"Attrition" or "scouring action" is reduced to a minimum in the Pennsylvania *ring type* Granulator due to its "rolling compression" crushing action. The rotor is mounted with four rows of impact rings, which assume the position of Ring #1 on the suspension shafts "A" and "B" when the rotor is revolving and the Granulator is running empty.

During crushing, the feed forcibly displaces or unhangs the rings from their natural support on shaft "A", compelling them to take a new position, where they are supported and rotatively *pushed* by shaft "B" (patented). Because of this position the rings are centrifugally off balance, which means a powerful force is urging their return to their shaft "A" supports.

This return effort causes the rings to press hard on the on-coming feed, reducing it by a "rolling compression" at a speed as low as 400 to 450 RPM. Thus the scouring action (found in conventional hammer and ring mills) is greatly reduced, giving less extreme fines and a more granular product.

Manufacturers of a complete line of crushing equipment • Hammermills • Single Rolls • Bradmills • Jaws • Gyracones • Granulators • Impactors • Bradford Breakers

PENNSYLVANIA CRUSHER COMPANY

DIVISION OF BATH IRON WORKS CORPORATION

LIBERTY TRUST BLDG., PHILADELPHIA 7, PA.

New York • Pittsburgh • Chicago • Los Angeles • Birmingham—Associated with Fraser & Chalmers Engineering Works, London

PRIMACORD makes it easy . . .

You can depend on Primacord to give you sure-fire results when the going gets rough. Branch lines down each hole initiate instantly the entire charge from top to bottom. Problems of deck loading are simplified by the use of Primacord. When you shoot, each charge *goes* with peak explosive power. You get thorough fragmentation—the kind that keeps big equipment on the move.

Primacord is flexible, easy to handle . . . it hooks up quickly with simple square knots or half-hitches. It's wound on spools that are a cinch to carry and unreel as loading operations move along. Insensitive to stray currents, it's the logical detonator to use around high-voltage electrical equipment.

There's a grade of Primacord to meet every blasting condition. Ask your explosives supplier; or write us direct. The Ensign-Bickford Co., Simsbury, Connecticut. P-21

PRIMACORD-BICKFORD Detonating • Fuse •

Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry

Coal Age

AUGUST, 1949

IVAN A. GIVEN, EDITOR

Better Hunting

WITH THE BLESSING of President Truman, accompanied by a crack about "unenlightened free enterprise," a House Judiciary subcommittee headed by Rep. Emanuel Celler, of New York, began beating the drums over a "monopoly investigation" early in July.

As might be expected, the investigation is to be directed against business in line with New Deal and Fair Deal policy. But to any but New Dealers and Fair Dealers, the first question that arises is: "Why business alone when the biggest monopolies of all are operated by labor unions?" If the subcommittee needs examples, it can find a good one in the coal-mining industry. The three-day working schedule recently laid down by Mr. Lewis is the latest in a long series of monopoly actions calculated to force up prices by restraining trade. And, piling Pelion on Ossa, an avowed goal in his present campaign is forcing the operators to join him in his program.

True, as part payment for political support, labor leaders and labor unions are exempt from the operations of the anti-trust laws. But anti-trust exemption does not make unions any less monopolies. If the administration and the Judiciary subcommittee are sincerely interested in moving against monopoly, an investigation of union activity should be high on the order of business. If further evidence to support recommendations for a change in the legislative and administrative approaches to the question of union exemption is necessary, such an investigation should provide it in abundance.

Critical Time

SUSPENSION or announcements of possible suspension of employee publications by certain coal companies in recent weeks may or may not indicate a trend. But if they do, there is real reason for concern.

Employee publications cost money and the results naturally are hard to put down in black and white. But the big need in the coal-mining industry today is a closer relation between operator and miner, with the miner taking a more-active part in matters affecting the industry and in turn his own livelihood. If the miner can be brought to realize that a closer relationship will pay off, he is more likely to insist that his national officers adopt a more-reasonable viewpoint on critical questions. That is only one of the benefits that can accrue to the operator. Therefore, now, if ever, is the time to bear down, both industry-wide and locally, on winning miner cooperation. No possible means of attaining that end should be neglected.

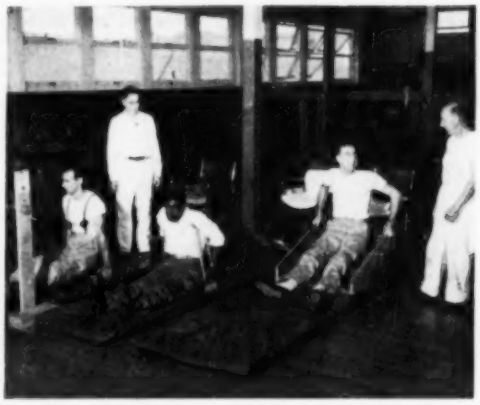
Worth Trying

WHETHER CONGRESS will get around to taking up, at this session, S. 1031 and its companion house bill, providing federal mine inspectors with police powers, remained to be seen at this writing. Whether the proposal will be adopted if it does come to a vote was another question, although the general opinion is that the chances are good unless additional members of Congress are persuaded that they should actively oppose this extension of federal powers.

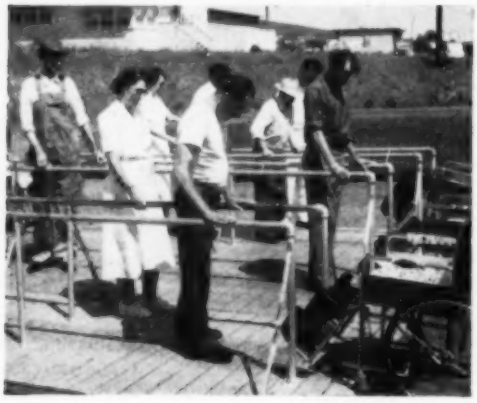
By favoring police powers, Congressmen and Senators would be publicly discrediting their own state governments and proclaiming to all the world that their fellow citizens were so indifferent to hazard and human suffering that it is necessary to ask outsiders to come in and take over. Of course, such a conclusion is completely false, although this means nothing to those members of Congress who acknowledge Lewis as their master, nor to those administration men interested in building up the powers of the federal establishment. To other Senators and Congressmen, however, this might be a new and appealing conception. Perhaps it is worth trying.

Care and California Sunshine Help Rebuild Disabled Miners

1 NEW ARRIVAL at Kabat-Kaiser Clinic gets complete examination. Overhead trapeze and special wheelchair help him get around.



2 EXERCISES, taught by experts, strengthen arm, shoulder and trunk muscles and improve muscular coordination.



3 PARALLEL BARS teach paraplegics to swing legs by using trunk muscles. Sunshine and fresh air improve mental attitudes.

4 FIRST STEPS with crutches are tricky, but patient nurses and the desire to walk again make the lessons easier.

5 CLIMBING STAIRS is a tough job for paraplegics, but they learn to do it with only one arm and a crutch or cane.

6 LEARNING TO WORK is the aim of most disabled miners. They start with simple finger exercises and special apparatus.

Anthracite Fund Helps Silicosis Victims Breathe Again

SILICOTIC MINER'S first step toward relief of pain is measurement of damage to his lungs. Complex apparatus does this job.

LABORATORY TESTS show how much oxygen enters his blood stream as well as chemical composition of exhaled air.

HELP IN BREATHING is provided by a cycling valve, which forces air into lungs. One treatment lasts six weeks.

REST AND SUNSHINE are good medicine for silicosis patients. Outpatient clinics are being set up in anthracite region.

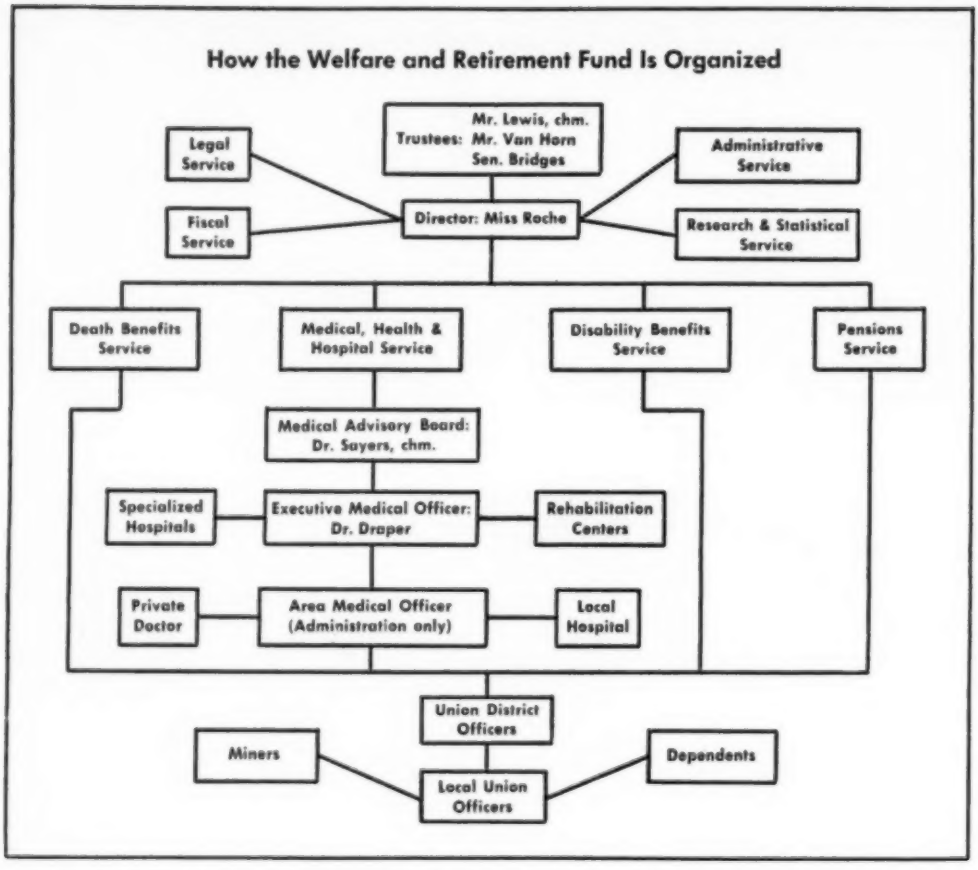
What the Welfare Fund Is Doing

Nearly 360,000 Persons Have Shared in Payments Totaling Close to $120,000,000, With Officials Preparing for Enlargement of the Program—Hospital and Medical Program the Area of Fastest Growth—How Future Looks

PENSION CHECKS had been paid to 19,188 retired bituminous miners and to over 3,000 retired anthracite miners at the end of April, 1949. Nearly eight months earlier, on Sept. 9, 1948, as he handed the first pension check to an over-age miner, John L. Lewis had voiced the thinking behind his long drive for welfare and retirement funds. At that time he said:

"The UMWA has assumed the position over the years that the cost of caring for the human equity in the coal industry is inherently as valid as the cost of replacement of mining machinery, or the cost of paying taxes or the cost of paying interest indebtedness or any other factor incident to the production of a ton of coal for consumers' bins. For that reason, the UMWA believe they are setting up a definite goal for others to follow to relieve the state of the necessity of caring for the extraordinary cost of industries which are particularly hazardous."

How much this "extraordinary cost" now amounts to each month in the coal-miner welfare program and how many beneficiaries currently are enrolled, fund officials



decline to state exactly. And nobody knows or is willing to guess what it will cost in the end to shape Mr. Lewis' ambitious plans into reality. However, by balancing data published at the end of December, 1948, against data made available as of May 1, 1949, it is safe to say that the bituminous fund now is spending about $9,900,000 per month for benefits and administration against an estimated income of some $9,000,000, based on a 20c-per-ton royalty on 90% of current bituminous production. Comparable figures are not available for the anthracite fund, but it can be assumed that here also, if costs are not actually exceeding income, they are crowding close against it.

With the bituminous fund thus running into debt and the anthracite program possibly following suit, and with Mr. Lewis' plans still far from realization, now is a good time for coal operators, union officials and other interested persons to explore the following questions:

1. How big is the need the funds are intended to meet?
2. What machinery has been set up to carry out the program and how well is the job being done?
3. What are miners, operators and the public getting for their money?
4. What lies ahead?

The first question goes to the heart of the matter. Depending upon interpretation, there is no limit to "need." Since, as a practical matter, the UMWA is in complete control of the funds, and so far is operating on the theory that it will decide what to do and present the bill later, the operators are confronted with a real problem—collecting the levy, if possible, from consumers who could scarcely be described as delighted at the prospect of increased fuel cost. If they rebelled in any substantial numbers—a distinct possibility—the picture then would be one of pressure for still higher levies, higher prices and accelerated loss of business, with one result fewer jobs and fewer days' work for employees.

The fact that it would be easy to fall into this vicious circle—if the industry is not already in it—results from the absence of any brakes or checks either on benefits that could be paid or on the number of beneficiaries. Already, evidence indicates that the union is reaching far out in distributing benefits, in addition to making it plain that its plans to reach further still. Aside from the over-all question of whether the present set-up is the best way to handle the problem, the industry and its employees therefore face a real hazard in a steadily rising level of expenditures.

Up to May 1, 1949, a period of about 24 months, the bituminous fund had cared for the following:

Death benefits—12,500 cases; total beneficiaries, 30,508 widows,

How the Bituminous Fund Has Grown

(CUMULATIVE DATA)

Period Ending:	Dec. 31, 1947	May 31, 1948	July 31, 1948	Dec. 31, 1948	Apr. 30, 1949
DISABILITY BENEFITS AND WIDOWS' AID:					
Grants	....	56,911	65,293	.....	106,937
Beneficiaries	....	127,540	146,296	186,038	266,722
Payments	....	$14,315,989	$21,311,858	.....	$67,976,452
Average total payment	$415	$535	$536.49	.....	$576
Average monthly payment	$45	$60	$62.34	.....	$61
DEATH BENEFITS:					
Grants	....	7,108	8,063	10,489	12,500
Beneficiaries	....	19,441	22,123	24,767	30,508
Payments	....	$7,052,583	$7,986,453	.....	$12,320,524
PENSIONS:					
Enrolled	First pension paid Sept. 9, 1948			11,698	19,188
Beneficiaries				.....	34,054
Payments				.....	$23,754,637
MEDICAL AND HOSPITAL CARE:					
Beneficiaries	....	.....	400	2,079	12,504
Payments	....	$500,000*	$685,079*	.....	$2,788,526
TOTALS:					
Beneficiaries	....	146,980	168,469	260,123	344,168
Payments	....	$21,968,572	$29,383,390	$68,000,000	$106,840,139

Estimated Income

1946-47 fund	$ 26,000,000
1947-48 fund	53,000,000
1948-49 fund (to April 30)	87,000,000
Total	$166,000,000

*Includes administration costs.

children, orphans and other dependents; total payments, $12,320,524.

Disability and widows' assistance—106,937 grants; total beneficiaries, 266,722, including miners, wives, children and widows; total payments, $67,976,452. Grants, periodically reviewed, average about 9½ months and cost about $61 per month.

Pensions—Total granted, 19,188; total beneficiaries, 34,054; total payments, $23,754,637.

Medical and hospital care—12,504 cases; total spent, $2,788,526.

Total disbursements—$106,840,139.

Total beneficiaries—344,168.

Meanwhile, between June 1, 1946, and Jan. 31, 1949, the anthracite fund's operations were as follows:

Death benefits—3,080 grants; total payments, $3,070,904.

Medical and disability benefits—82,184 payments; average monthly payment, $40; cost, $3,287,380.

Pensions—Total granted, 3,138; total payments, $803,500.

Medical and hospital care—Treatment for 502 silicotic miners and "a number of paraplegics."

Total disbursements—$7,261,784.

Total beneficiaries—15,025.

As of Dec. 31, 1948, total payments from the bituminous fund were reported to be "in excess of $68,000,000." By May 1, 1949, total disbursements had soared to $106,840,139. In other words, the bituminous fund averaged about $3,400,000 paid out monthly for the first 20 months of its existence; for the first four months of 1949, $9,710,000. Going back still further, the average cost of a disability grant as of Dec. 31, 1947, was $415; as of April 30, 1949, $576. Administrative costs, averaging about 2% of over-all expenditures, push current disbursements up to about $9,900,000 per month.

The total, it is plain to see, is big, with the more costly part of the program, as contemplated by the union, still to come, bringing up again the question of how far it is practical to go with this or any plan, keeping in mind the humanitarian factors involved, the stability of the industry and the willingness of the customers to pay the price.

A disabled or sick miner, for instance, draws up to $60 a month, plus $20 for his wife and $10 for each dependent child. The duration of each grant depends upon the doctor's forecast of the patient's need, but no grant is made for longer than 12 months, at the end of which period recertification is required. In 1948, the average disability grant lasted 9.4 months at a cost of $61 per month. A miner's widow, after receiving the initial $1,000 death benefit, may draw up to $60 monthly, plus $10 for each dependent child. All disability and widows' assistance grants are decreased by the amount paid by social security, workmen's compensation and any other regular income. Out of a total of 266,722 beneficiaries of disability and widows' assistance grants, 72,000 have been dropped from the rolls after investigation has shown that they no longer need help.

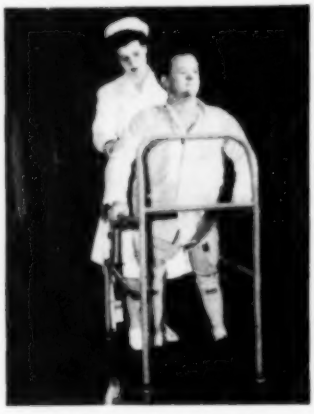
The fund's experience with pensions has been as follows: The average employment period is 36 years, against the contract's minimum requirement of 20 years. The average age of applicants is 66.1 years, 16% of them being over 70 at the time of retirement, 10.6% retiring at 62 and 10.8% at 63. About 73% of all pensioners had retired prior to Oct. 1, 1948, when pensions first were paid. Of the 27% who have been granted pensions since that date, half had been receiving disability grants prior to retirement. In the first four weeks after the retirement age was lowered from 62 to 60, five applications were received from 60-year-old men and six from 61-year-olds.

Here is how the bituminous fund works:

As the organizational chart shows, the three trustees are the top authority. They make policies and set up rules and regulations. The director, Miss Josephine Roche, supervises all operations and is responsible to the trustees. Four groups of specialists advise Miss Roche on legal and financial matters, provide statistical data and direct administrative services. Practically, as previously pointed out, control is completely in the hands

How Eddie McGinnis Learned to Walk Without His Legs

ARMS AND SHOULDERS get a workout.



STROLLER helps him use new legs.

CRUTCHES call for careful balance.

of the union under the present trustee set-up.

The fund reaches miners and their dependents through four main services—pensions, death benefits, disability benefits, and medical, health and hospital benefits. The spadework of finding and reporting cases, getting the facts and filling out applications is done by an officer of the local union, usually the welfare officer. After study and verification of the facts by district union officials, all applications, except those for medical and hospital care, are sent directly to Washington headquarters and there are routed to one of the four services.

Use of local and district union officials, it is pointed out, keeps administrative costs low. Recently, Mr. Lewis reported that the backlog of applications had been disposed of and that operations of the pensions, disability and death services were on a current basis, with only 24 hours needed for processing a death claim and "only a few days" for a disability or pension claim.

The course traveled by a request for medical or hospital care is longer, because in this field, where the fund expects to do its biggest and most costly work, the organization necessarily is more complex.

At the top of the medical, health and hospital service, reporting to Miss Roche, is the medical advisory board. The board reviews the work of the service periodically, makes recommendations on policy and sees that the newest techniques are used to treat and control sickness and disability. The board is headed by Dr. R. R. Sayers, former chief, U. S. Bureau of Mines, and a public-health expert by training and profession. Nine medical men, associated with insurance companies, public health services, the American Medical Association and medical schools, work with Dr. Sayers.

Over-all operations of the medical, health and hospital service are directed by Dr. Warren F. Draper, former deputy surgeon-general of the U. S. Public Health Service and now executive medical officer of the fund. Besides receiving reports from area medical officers stationed in mining districts and acting on their recommendations, Dr. Draper arranges with specialized hospitals and rehabilitation centers to care for sick and crippled miners and dependents who cannot obtain satisfactory treatment near their homes. Dr. Draper is assisted by an administrative staff in Washington. Ten area medical offices, located according to estimated miner population, have been set up, each serving one or more UMWA districts.

Under Dr. Draper's direction, 10 area medical officers, each with an administrative assistant, carry out the program locally. An area medical officer does not treat patients. His duties are purely administrative. If a miner or some member of his family needs a doctor or hospital care, the word is passed along through his local union's welfare officer, up to district union headquarters and thence to the area medical officer or his assistant. By telephone, telegraph or letter, depending on the urgency of the case, the medical officer asks a local doctor who lives close by the patient to look into the case and report what he finds. If he reports that the case needs treatment and that he can provide it, the medical officer tells him to go ahead. If the local doctor thinks hospital care is needed, the medical officer arranges for the patient to enter a hospital close at home if his particular case can be treated there. If the treatment he needs cannot be provided locally, the case, with the recommendation of the local doctor and the area medical officer, is passed along to Dr. Draper, who arranges for hospital or medical care elsewhere.

Area medical officers make agreements with local doctors and hospitals for fees and hospital charges, either on an individual patient basis or by a group contract. Fund officials point out that endorsement of the program by many local and state medical associations minimizes the threat of unreasonable fees and charges.

The fund pays all fees and charges, the aim being, as Dr. Draper has said, "to provide a prepaid form of hospital service and medical attention in all the districts and all the local unions."

The biggest job of the medical, health and hospital service thus far has been cleaning up a backlog of cases, restoring health as far as possible, providing relief for incurables and, wherever it can be done, helping handicapped men become useful citizens again. Over 73% of the men granted disability benefits are said to have been disabled or sick for many years before the fund was set up.

Probably the most dramatic work has been done with paraplegics and other seriously crippled men. As of May 1, 1949, the bituminous fund had placed 380 paraplegics under treatment, plus a number of men with multiple sclerosis, arthritis, spinal tuberculosis, Parkinson's disease, mental or nervous disorders, digestive or circulatory trouble or

BACK TO BED after a walk. McGinnis hoists himself in.

A GOOD MEAL after a busy day. Tomorrow, another workout.

double amputation. "Almost half" of the 380 paraplegics are learning to walk again.

In groups of various sizes, sick or injured miners have been sent to the following specialized institutions: Kessler Clinic and Crippled Children's Hospital, Newark, N. J.; New York University Institute of Rehabilitation and Physical Medicine, Lenox Hill Hospital and New York Post Graduate Hospital, all of New York City; Huntington (W. Va.) Orthopedic Hospital; Kabat-Kaiser Institute and Permanente Foundation Hospital, Vallejo, Cal.; and George Washington University Hospital, Washington, D. C.

For example, the case of Eddie McGinnis, United, W. Va., shows how some paraplegics are being restored to usefulness. Early in 1946, a rock fall broke his back and severed his spinal cord. His paralyzed legs were amputated at the thighs. After using up his $1,800 state compensation in a West Virginia hospital without making much headway, he returned home and for 22 months was cared for by his wife and small daughter.

In October, 1947, McGinnis became the first paraplegic to be cared for by the bituminous fund. At the Kessler Clinic, his treatment followed the pattern used by the Veterans' Administration in caring for some 2,500 paraplegic war veterans. He was given a complete mental and physical checkup, his bed sores were healed and new skin was grafted over the holes, his weight was restored from 82 to 160 lb, he learned control of his bladder and bowels, strengthened his arm and shoulder muscles by special exercises and was provided with artificial legs, crutches and a wheel chair. After eight months at the clinic, McGinnis learned how to get around on his new legs. Now back at home, his spirits are good and he is talking about setting up a small business of his own.

Restored health and ability to get around are not the end of the story for McGinnis and others like him. The fund is making efforts to steer them into some useful and profitable work. At present, only a few of the cooperating hospitals have print shops and similar facilities to help patients find new kinds of self-supporting work while under treatment, but Dr. Draper and his associates hope eventually to see these facilities enlarged and to make wider use of federal and state services in vocational guidance and rehabilitation. For example, only recently, on May 11, a joint agreement between the fund and the Illinois Division of Vocational Rehabilitation was drawn up whereby the state will provide professional guidance, vocational training, occupational tools and job placement for men who have been discharged from hospitals after treatment.

Treating and rebuilding a man like McGinnis costs from $8,000 to $10,000 and takes from six to eight months. Mineworker leaders, however, see big dividends not only in making men useful once more but also in reducing relief costs to the state. One rehabilitated paraplegic, for example, now runs a small lunchroom that pays him about $50 a week. Another has a small general repair shop and is taking a course in radio repair from the state rehabilitation service. A third operates a watch-repair shop and a fourth recently was elected justice of the peace in his home town.

These men, instead of remaining public charges at a cost of $600 or more per year to the state, now are making their own way and, in the course of time, fund officials believe, will pay income and other taxes that will more than pay back what the state paid out for their relief and vocational rehabilitation. Likewise, money paid to aged and disabled miners and their dependents and to widows and orphans, it is argued, is circulated in local communities, stimulating trade and thus helping private business and the townspeople at large.

Officials of the anthracite fund are laying out much the same sort of medical, health and hospital service. Major stress in the anthracite program is on anthracosilicosis. Because little is known about this disease, the starting point of the program was a $575,000 grant to the Jefferson Medical College, Philadelphia, Pa., and its associated hospitals for research in silicosis and treatment of patients. As of February, 1949, $100,000 of this sum already had been paid to the college and its two hospitals, Barton Memorial, in Philadelphia, and White Haven Sanatorium, in Luzerne County. At the end of January, 1949, these institutions had cared for 502 men through in-patient and out-patient services.

The first steps in treating a silicotic miner are taken at Barton Memorial, where most of the research also is being done. There, experts in lung disorders give him a complete physical going-over and, aided by a breathing mask, a measuring tank, a gasometer and blood samples, find out how much air is entering the patient's lungs, how much carbon dioxide is being ex-

pelled and how much oxygen is reaching the blood stream. With this information, the doctors learn what mixture of drugs and what quantity of oxygen will give the patient most relief.

As a further step in measuring the stage of the disease and the patient's needs, Barton Memorial doctors have developed a motorized steel treadmill which can be tilted and otherwise controlled to approximate some mining conditions. With the patient walking on the treadmill, doctors can learn how much oxygen he needs to do his work.

Research at Barton Memorial already has shown, among other things, that X-rays do not tell the whole story about a silicotic's lungs. Reliance on X-rays, doctors state, therefore has barred many silicotics from workmen's compensation. Now, with new ways of measuring disability, it may be possible for silicotic miners to draw the compensation benefits they are entitled to.

Silicosis Pains Eased

At White Haven Sanatorium, over 500 silicotic miners who volunteered as "guinea pigs" have been given some relief since the start of the program, though a real cure for the disease still seems a long way off. Guided by records from a miner's initial going-over at Barton Memorial, White Haven doctors use a nebulizer, combined with an intermittent positive-pressure cycling valve, to force an oxygen-and-drug mist into the lungs. The valve, developed during the war to relieve airmen suffering from lack of oxygen after high-altitude flights, does the real work of inhaling and exhaling for the patient, thus relieving him of the painful breathing caused by silicosis.

During their six- to eight-week stay at White Haven, silicotics also may obtain treatments for other disorders, such as kidney ailments, heart disorders and ulcers. When their course is completed, they return to Barton Memorial for a follow-up examination.

White Haven also operates an out-patient department for silicotics who are not sick enough to be hospitalized but come in from time to time for treatments. Other outpatient facilities now are being set up throughout the anthracite region. "One treatment with the nebulizer," it is reported, "permits the patient complete rest, complete sleep and relaxation for a period of six weeks."

Adding up all that is being done by the two welfare funds—medical and hospital care, disability payments, death benefits and pensions —where does miner welfare stand now? On the basis of what can be learned, the following observations seem to reflect the current situation:

1. The funds already are straining against the limits of the 20c-per-ton royalty.

2. Mr. Lewis' dream is not yet fulfilled. In fact, the most costly service planned—medical, health and hospital care—is only just getting under way.

3. There is a genuine need for at least some of the services rendered by the fund, but a big question yet to be answered is what and how much.

4. A master plan centralizes the spending of moneys and standardizes and equalizes benefits to miners. Complete domination by the union, however, is scarcely the answer to preserving the interests of all parties involved.

5. The reluctance of high fund officials to talk freely about their work, their organization and their plans clouds some of the facts and prevents an exact appraisal of current achievements and future needs.

Some inferences about what lies ahead for the funds can be drawn from several sources.

To begin with, the program probably is here to stay as long as the union stays strong and the industry healthy. Whatever the merits of welfare and retirement funds in principle and whatever operators and others think of the program's machinery and accomplishments, the fact remains that miners have given the program an enthusiastic welcome. Any move to abandon it or whittle it down probably would provoke a major upheaval among miners and turn public opinion against the operators.

No one knows what the cost will be in the end. However, Mr. Lewis and Miss Roche have made it clear that miners' needs—not the income to the funds—will be the measure of the program's breadth. Expressing her views, Miss Roche has said, "I have a feeling that the care of the UMWA members and their families is going to be adequately followed through. We will advance —we will not stop. We will move forward on the basis of experience and not of blueprints."

That, to say the least, is an elastic definition of needs and prospects. It takes no account of how far coal, now in the midst of a tough competitive battle with other fuels, can jack up its price to provide more income to the program. Thus far, the fear that price increases due to wage boosts and other rising costs would turn customers to other fuels has not deterred Mr. Lewis. It is not likely to slow him down in the future, though he doubtless knows that the stability of the welfare funds is tied to high production. In other words, he cannot weaken coal's competitive strength without hurting the welfare and retirement program.

Miners Seek More Benefits

Other indications of what lies ahead for the funds are suggested by what the miners themselves are thinking about the program. For example, among over 500 so-called "miscellaneous" resolutions offered by local unions at the mineworkers' convention last October, at least 45 asked that the pension age limit be lowered or even abandoned altogether in favor of a length-of-service requirement. Suggestions for an age limit ranged as far down as 45.

Fourteen resolutions asked that the labor and cost of processing welfare applications be shifted from local unions to the fund's staff. This, naturally, would boost administrative costs considerably. At least seven resolutions requested bigger benefits in one or several classifications. Seventeen resolutions asked for free house water, better town sanitation, improved bathhouses and other facilities and 11 demanded better housing. Though the convention acted variously on these petitions, endorsing some and allowing others to die in committee, they do reflect miner thinking about the welfare program and what they expect of it.

Discontent with local medical and hospital care came to light in 33 resolutions suggesting that the fund build its own hospitals. However, if the welfare program follows the policy stated by Mr. Lewis, the fund will not build hospitals. Speaking about his plans for medical and hospital service, Mr. Lewis has said: "It is not our purpose to erect hospitals or conduct medical centers or establish or maintain our own medical clinics, but to utilize the existing medical and hospitalization centers, making contracts with them for their services at acceptable standards. . . It is the purpose of the fund to encourage the expansion of existing facilities.

In this respect, I think we have the cooperation of the American medical profession and we are moving slowly in that field because we want to be assured that we are moving properly and correctly and with sound judgment."

This statement, together with Mr. Lewis' order at the convention that local union welfare funds be liquidated, points to the end of payroll checkoffs for medical and hospital care and a readjustment of the relations between miners and company-sponsored clinics.

Explaining the reasons for his order, Mr. Lewis declared that (1) benefit payments will be standardized, (2) operator opposition to the union-wide fund, on the ground that needs are cared for locally, will be dissolved and (3) the financial burden will be shifted from the miners to the industry and its customers. If Mr. Lewis goes ahead with his plan, local clinics will be asked to make a contract with the fund and to change their operations to fit the new pattern. This readjustment may spark some sharp local disagreements in the future, with the clinics and local mine companies pitted against union and fund officials. Whether Mr. Lewis' plan will give miners better care remains to be seen.

Want Death Payment Upped

In the near future, a drive to increase the death benefit seems assured. Among other things, Mr. Lewis told the mineworkers' convention last October that "We hope the day will come when the death benefits will substantially exceed the $1,000 now being paid. . . Any increase, of course, will depend upon the contractual arrangements made in the future by and between your union and the coal employers of the nation."

Pressure also can be expected for better housing and improved living conditions for miners. Union leaders probably have not thought far along this line up to now. However, the Boone report has been studied carefully on local as well as top union levels and the UMWA is far from satisfied with the way many of its members live. What shape a campaign to improve living conditions might take is a matter of conjecture just now. Would the fund build sewers and bathrooms? Would it finance improvements made by individual miners or a community of miners? Or would union and fund leaders stage a campaign to force companies to make improvements, whatever the cost?

For the more distant future, fund planners are thinking in terms of a broad program of preventive medicine and health education, including sanitation, diet, living habits and such matters, as well as vaccination, inoculation, periodic physical examinations, prenatal care and dental and other services. Just now, however, they are preoccupied with more urgent problems and full growth of a program of preventive medicine and health education probably lies somewhere in the future.

Miner Contributions Barred

Meanwhile, what about the attitude of the miners, beyond welcoming care for themselves and their families in sickness, disability and death?

From now on, it probably will be more difficult for an individual coal company to convince workers that it really wants to do something for their welfare. That may be the way union officials want it, so that miners will look to the union alone for their well-being. Some distortion of company motives therefore can be expected along the lines of a resolution introduced at the miners' convention in October. Adopted by one of the locals and referred by the convention to district officials for action, the resolution alleged that the company's plan to add bathrooms to company-owned houses was only a pretext for raising rents. The miners did not object to the bathrooms. They simply did not want to share the cost of improving their homes, choosing rather to question the company's motives.

In fact, no proposal that the miners share the cost of improving their condition is likely to get very far. The resolutions committee at the convention, for instance, curtly recommended defeat of two resolutions offered by local unions, one suggesting that miners pay 10 to 25c monthly into the fund, the other that they contribute 2% of their earnings to the fund. The industry and, in the end, the coal user therefore can count on continuing to bear the whole cost of miner welfare.

Thus, putting it all together and taking the short-term view, coal operators can expect pressure for higher and higher expenditures for miner welfare. In the long view, however, assuming no increase in the scope of the fund, there may be some hope for cutting costs. Here are the possibilities:

1. The industry is steadily improving its safety record and providing better working conditions for its men. This will mean, over the long haul, fewer men injured, fewer men disabled by sickness, fewer men dying before their time and therefore fewer demands on the fund.

2. At present, a big share of the money is going to cases accumulated over a good many years, some as far back as 25 years. Once these are disposed of, the fund can go on a current basis, taking care of each case as it develops. This possibly will mean lower cost.

3. New machines in coal mining, such as the continuous miner, will cut manpower requirements per unit of production and thus, in the long run, reduce the burden on the fund.

Meanwhile, what attitude should the operators take toward the fund? Having had it thrust upon them, there are two possibilities:

1. A campaign to eliminate the present fund entirely—a highly improbable goal—or its replacement with another of a different type. The prospects of attaining this latter goal might be slightly better but not much.

2. A campaign to bring the present fund more into line with the realities of the situation including, among other things, a down-to-earth approach to the welfare problem and an administrative set-up that would give the operators a real voice in fund operations.

Pending the attainment of one of these goals, it is not enough merely to pay into the fund. To see that the costs of coal and miner welfare are kept within reason, that workers get a fair shake and that the industry stays strong and healthy, operators should set their sights on the following:

1. Stress on safety among workers and prompt installation of methods, machines and equipment that promise to make mining safer, easier and healthier.

2. Increased pressure on boosting output per man per day by installing modern machines and seeking better employee relations, thus offsetting the cost of welfare levies.

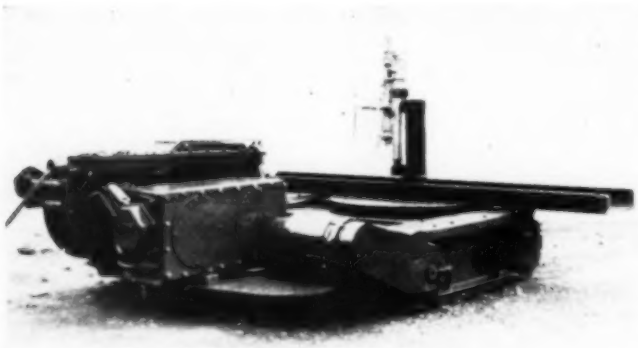
3. Insistence upon a full accounting for welfare funds and operations, thus providing watchdog protection for the interests of operators as well as miners.

STOPERS IN ACTION, with double-stinger type left and short stoper right.

How to Operate a Stoper

How Stoper-Type Roof-Bolting Drills Are Made and Function—How Experienced Users Go About Operating Stopers for Maximum Safety and Efficiency—Care and Handling of Stoper Equipment on the Job

ROOF BOLTING has brought a new machine into the coal-mining industry and with it the problems—both operating and safety—that always arise with an unfamiliar piece of equipment. The machine in question is the stoper—an air drill designed for making vertical or upward-slanting holes in rock. While auger-type drills are being used in roof bolting, the stoper is the machine normally employed. Even with boring, however, air equipment ordinarily is necessary to drive the bolt over the wedge and screw on the nut holding the channel or plate.



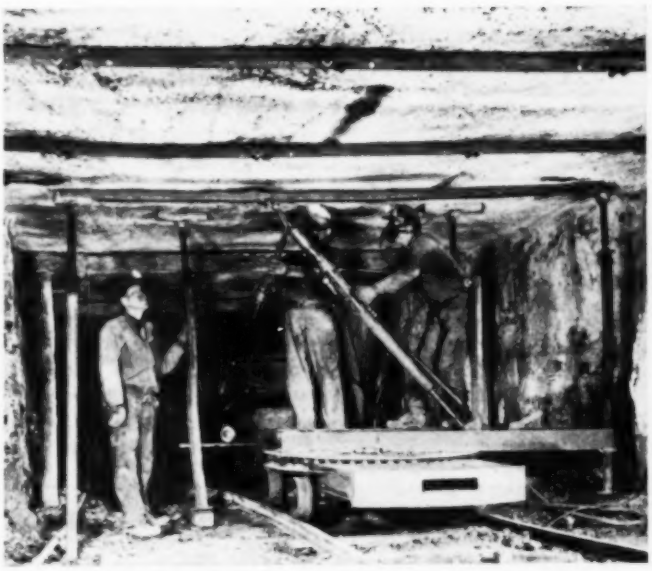
TRACKLESS MOUNT for short-type roof-bolting stoper.

Stopers are an old story to the metal and non-metallic mining industry. But their operation still results in crises such as that described by A. W. Knoerr, associate editor, *Engineering and Mining Journal*, in an article on stoper operation in the August, 1948, issue, from which much of the following material has been taken. Reports Mr. Knoerr:

"After wrestling with a stoper for a while, a husky miner in a western camp threw down his machine and bellered: 'Why you so-and-so, if you could only stand up and fight.'"

Continuing, Mr. Knoerr summed up the situation as follows:

"That's the way a lot of green miners feel when they first tackle one of these animals that snorts compressed air, spouts a spray [wet drilling is the usual practice in metal mining], jumps like a



MINE-CAR MOUNT for standard stoper, showing use of safety tool in driving bolt.

kangaroo, winds the operator up like a boa and hides a stinger in its tail. But," Mr. Knoerr adds, "don't let this introduction discourage you because the 'buzzey' can be tamed to do a fast, clean drilling job . . . if you know how to handle it."

Two general types of stopers are used in roof bolting. One is the conventional metal-mining machine which can be employed in thick seams. The second is the short machine especially designed for use in thinner coal. Examples of both types are shown in the accompanying illustrations.

The major difference between the two types is that the length is decreased in the short machine by placing the feed leg back of the drill itself instead of as an extension at the bottom. As a result, over-all length with the feed leg retracted, is as little as 21 in in some recent models.

In stoper operation, compressed air at approximately 90 psi is admitted to the drill through a throttle valve to cause a piston to move back and forth at a speed ranging from zero up to 2,000 strokes per minute. The piston acts as a hammer, striking an anvil block or tappet, which in turn strikes the end of the drill steel held in a chuck.

The stoper, in addition to hammering the steel, rotates it also in most models. This is done by means of a specially grooved rifle bar over which the piston slides back and forth. Since the rifle bar is prevented from turning backward by pawls, each stroke results in a slight rotation of the piston in a forward direction. Flutes on the piston engage other flutes in a nut on the back of the chuck and therefore the chuck is twisted slightly with each piston stroke and in turn twists the drill steel.

A rotation release normally is provided in roof-bolting stopers to permit stopping chuck rotation either in drilling or when the stoper is being used as a hammer to drive the bolt over a wedge anchor. An air—or electrically operated "impact wrench" may be used with the stoper for screwing on the nuts holding the channel or plate. At least one line of stopers, however, features built-in torque wrenches. If the holes are bored with an auger, a separate hand-held air hammer may be employed, as shown in an accompanying illustration, for driving the bolt over the wedge.

For driving purposes, a "dolly," or adapter, normally is employed. A threaded socket in one end of the adapter permits it to be screwed onto the bolt, while the other end is shanked to fit in the stoper or air-hammer chuck. A special safety tool, as shown in an accompanying illustration, may be used to hold the dolly during driving. This same illustration also shows a special mine-car mount for a standard-type stoper, including turntable, post and wire line to help hold the stoper at any desired angle, thus relieving the operators. A second illustration shows a trackless mount for a short-type stoper normally drilling straight up, also with turntable and rails to permit moving the post holding the stoper back and forth to any desired position. Many stopers, however, are and will be operated without mounts, and where this is the situation a few more things have to be watched.

In a stoper, the drill is raised to move the bit upward by means of the feed leg previously mentioned, although at least one roof-bolting stoper uses a chain feed. With the conventional feed leg, however, opening the throttle releases air into a cylinder which forms the outer shell of the feed leg. This pushes down on a piston (the leg), on the lower end of which is a pointed tip, or "stinger." Since the leg cannot move downward, the effect is to force the drill upward, feeding the steel into the hole. Most stopers are fitted with a button or valve for bleeding air out of the feed leg to ease the pressure on the drill steel or to let the entire stoper drop down.

Stopers, particularly the conventional types, may be equipped to feed water through the drill steel into the hole to facilitate drilling and kill dust. If dry drilling is done, wearing respirators is advisable.

With an idea of how stopers are built and how they work, the next step is using them to make holes. But there still are a few preliminaries:

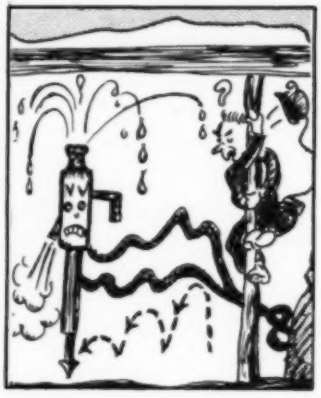
1. Never drill without checking the place and making it safe. The first concern is the condition of the top because it shortly is going to be subjected to a lot of hammering and vibration and you, as the operator, are going to be under it. Sound the top, take down anything that's loose and set safety posts or jacks.

2. Set the drill up the way it should be set up. First, blow out the air hose—before you connect it to the drill—to remove rust or grit that might stop the machine. Likewise, flush out the water hose if your stoper is equipped to use

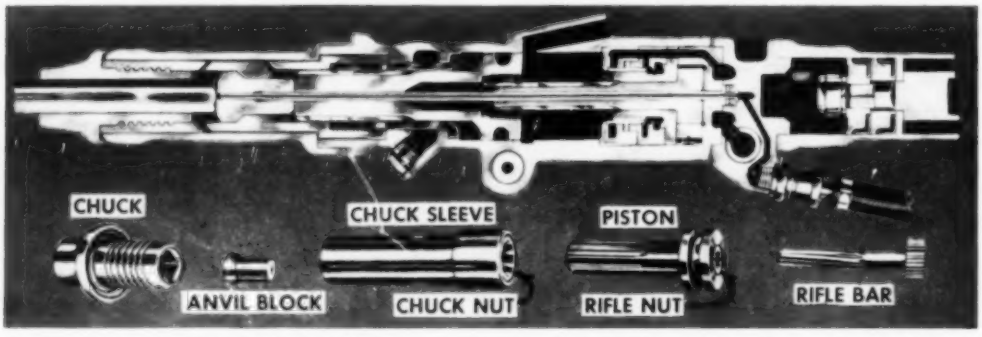
How Stopers Are Built and How They Should Be Operated in the Mine

MAKE THE PLACE SAFE. Sound top, bar down and set safety timbers.

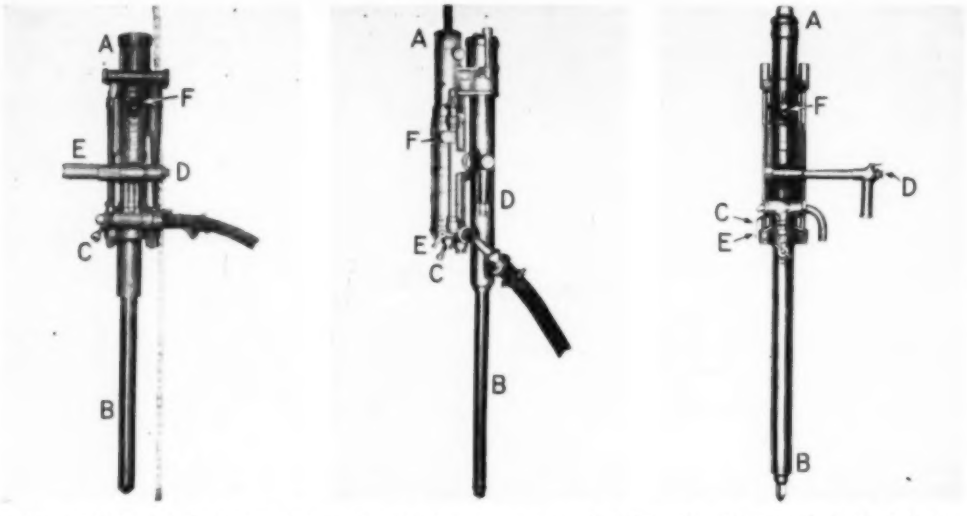
KEEP HANDS OFF THE CHUCK to prevent injury if the steel jumps out.



SHUT OFF ALL CONTROLS before you turn on the air and water.



SALIENT PARTS AND INTERNAL CONSTRUCTION of one make of stoper, showing the elements holding, driving and rotating the steel.



STOPERS FOR ROOF BOLTING in both thick and thin coal. Indicated parts are: A, chuck; B, feed leg with stinger; C, throttle; D, feed-leg control button or valve; E, rotation release; F, oil plug.

DON'T GET UNDER THE STOPER and don't straddle it. Stand to one side.

DON'T GET WRAPPED UP. Let go the handle when the stoper twists.

water. Some drills have air and water screens. If so, make sure they are not clogged.

A line oiler may be installed in the air hose. If so, fill it—and the oil reservoir in the drill cylinder—at the start of the shift and repeat as necessary, following the manufacturer's recommendations. If the drill is being handled right, plugs of waste will have been put in the chuck and the air and water connections at the end of the previous shift to keep dirt out of the machine. Take them out and connect the nose or hoses.

3. Double check on safety. You should be wearing gloves—preferably leather—because rocks have a habit of dropping from the collar of the hole and can cut your hands badly. Also, if the steel sticks, the stoper may twist and slam your hand into something, although one design of stoper has a feed-leg extension to the roof as well as to the bottom which prevents twisting after drilling has started. It also holds the drill up while steels are changed. Because you will be looking up most of the time, you should be wearing goggles. Get any loose timber or other material away and arrange all tools, steels and bits neatly at one side. Arrange the hose so you won't get your feet tangled in it.

Drill steel should always be stood with the bit end down. Otherwise, dirt might stick to the shank end and be forced into the chuck or plug the steel. Shank ends of all steels should be perfectly square with the sides. If the ends are chipped or crooked, don't use the steels because they may wreck the tappet and chuck.

Check the top and the place again and be sure you remember a few other safety tips:

A. Never stand or kneel on the downhill or under side of a stoper if you are drilling at an angle. The machine can fall on you if something goes wrong. Also, don't straddle the machine if it happens to be one you could straddle. Get to one side, make sure of your footing and balance, hold the stoper by the handle and don't let go. Keep your hands off the chuck at all times. You might lose some fingers if the steel should jump out and the drill spring upward.

B. Be certain all connections are tight. If they should break loose, you might get knocked down by the hose.

C. Before opening the air valve back to the compressor, be sure that all controls on the stoper are closed. If they aren't, the machine may start traveling and knock you around considerably. Also, don't monkey with the controls when the machine is lying down. Try particularly to avoid opening the throttle accidentally. One of the things that could happen is having the stinger shoot out and nail you in the leg.

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Now, you're ready to drill. Pick good, solid footing for the stinger or, if you use a block, make sure it is level and solid. To collar or start a hole, look for a slight depression in the top or make one with a pick. This keeps the bit from bouncing away. Perhaps you can throttle the stoper down so the bit itself will chip out a pocket, but this is not too advisable since it increases the chances of the machine bouncing off and giving you trouble trying to hold it. In collaring, the drill should always be at right angles to the top—in other words, straight up. Later, the position of the drill can be changed as necessary if an angle hole is desired. Be sure the drill stays on the hole line after it is started.

The steps in collaring a hole are:

1. Place the right-sized bit on the starter steel. If, for example, a hole is to be drilled with three steel changes, choose the smallest bit that will permit using two still-smaller bits on the second and third steels.

2. Raise the stoper so that it is at right angles to the top.

3. Place one hand on the throttle and the other on the release button or valve.

4. Press the release button or open the valve slightly and open the throttle just enough to raise the bit to where the hole is to be collared.

5. Open the throttle and start rotation as the bit strikes the rock.

Once the hole is collared, you can go ahead full throttle, unless you strike soft or ravelly ground, or a slip or seam. If you do hit soft or ravelly material, use only half a head of air on the release button and cut down on the throttle. If possible, work the steel up and down in the hole with the release button. Go easy if you drill into a slip or seam to keep the steel from veering off line and sticking.

Some of the things that can cause stuck steels are:

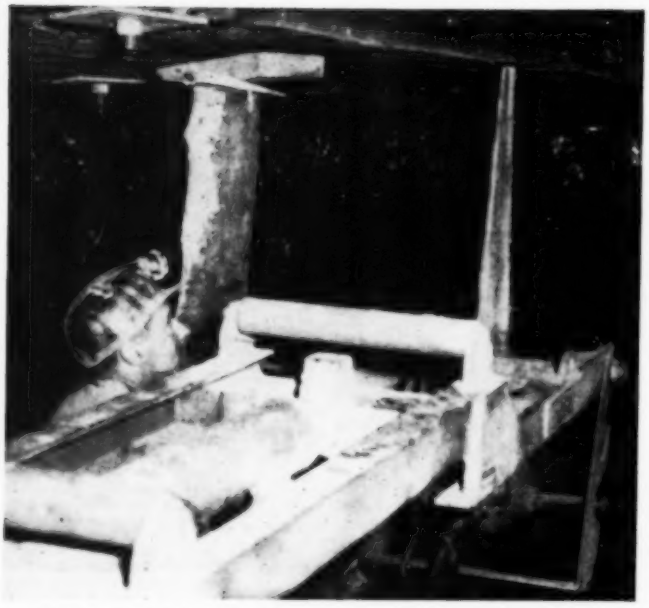
1. Slips or mud seams.

2. Stoper getting out of line.

3. Bits of the wrong gage or with badly worn reamers or cutting edges.

4. Plugged bits or steel.

5. Failure to use the release



BORING BOLT HOLES with electric auger on converted rubber-tired timber setter.

DRIVING BOLT (left) with light air hammer into auger hole. The nut is screwed on with a separate impact wrench (right).

button to get proper free rotation.

6. Running steel into a partially drilled hole with the throttle wide open.

If you are running at full throttle when the steel sticks, the powerful rotating device in the drill will start to twist it instead of the steel. If you hold on, you may get wrapped up. Shut off the air, let go of the handle and step back.

A stuck steel sometimes can be removed by turning it with a wrench and pulling at the same time. If a wet-type machine is being used, running plenty of water into the hole may free the steel. It is often faster, however, to drill a new hole alongside the lost one.

After the starter has been run out, use care in backing out of the hole. Operate the controls so the steel will stay in the chuck. Otherwise, you may get it on your head. Some drills are designed to grip the shank of the steel and thus facilitate pulling it down out of soft material.

When changing steels, be sure to select one with the properly gaged bit and check to see that the steels are not plugged. Some miners use a soft hammer to knock off bits, hammering the joint between the bit and rod rather than the bit wings. The resulting vibration loosens the bit. Other miners hit the steel on something back of the bit to get the same results. For real drilling speed, new bits should be attached to the steel changes well ahead of the time they are to be used.

Taking care of the stoper is the final point in good drilling. Stopers ordinarily operate smoothly but if they run out of oil the close-fitting parts inside will burn to blue hardness in a short time. Therefore, if the drill starts to heat or act sluggish, check the oil. Better still, keep an eye on the chuck and drill-steel shank. Oil slicks in these places are a sign that proper lubrication is taking place. Also, watch the exhaust. It should feel oily or sticky to the hand. Check the side rods to see that they stay tight. Otherwise, the stoper will come apart at the seams and damage the internal parts seriously. If the machine is a wet unit, check the water needle regularly to see that it is functioning properly.

Finally, because a stoper may give you a rassle, don't beat it with a hammer or steel or throw it around. A stoper is a precision-built machine and needless abuse can cause damage.

After the shift has been drilled out, shut off the air and water, coil the hoses neatly and put them away where they belong, pour a little oil into the chuck, plug the chuck and hose connections with waste, and, finally, lay the stoper gently down in the storage place or on the truck.

Acknowledgments—In addition to *Engineering and Mining Journal, Coal Age* is indebted to the following for assistance in preparing this article on stoper operation: U. S. Bureau of Mines, photos, top center, bottom, p 78; and top p 79; Consolidation Coal Co. (Ky.), photos, p 82; Chicago Pneumatic Tool Co., Gardner-Denver Co., Independent Pneumatic Tool Co., Ingersoll-Rand Co., Joy Mfg. Co., LeRoi Co. (Cleveland Div.) and the Worthingon Pump & Machinery Corp.

MODERNIZED PREPARATION PLANT has been adapted for full-seam mining. Raw feed for daily output of 10,000 tons of clean coal comes mostly from company's big mines close by. Trucks from smaller mines dump up to 3,500 tons daily of raw coal into bins at left.

Modernizing a Modern Plant

New Mining Methods and Changing Markets Dictated Up-Dating Consol of Ky. Plant—How Problems of Feed Size, Fines Recovery and Refuse Disposal Were Solved —Maintenance Costs Also Reduced

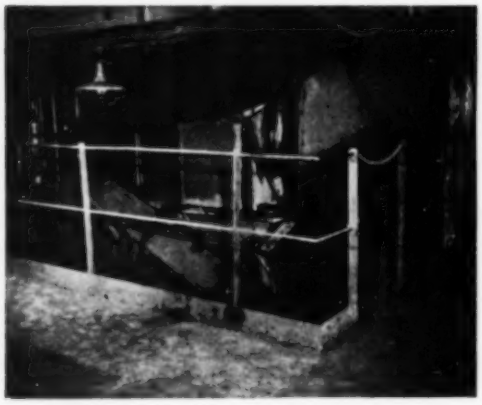
CHANGES IN MINING CONDITIONS and methods, as well as changes in the market demands and the availability of equipment and maintenance materials, can take place so fast that between the planning and the completion of a large preparation plant a need for extensive plant alterations may develop.

Until recently, this was the situation faced at the 10,000-ton central preparation plant which the Consolidated Coal Co. (Ky.) built at Jenkins, Ky., under the strain of wartime economy and put into operation in August, 1942 (*Coal Age*, April, 1943, p. 65). That plant, turning out "Consol Cavalier" coal, served very well during the war, but following the trend of the times, which brought an expansion of full-seam mining with a much higher percentage of refuse, a demand for still higher quality cleaned coal and the use of more water underground to allay dust, a plant modernization program was started in 1946 and recently was completed.

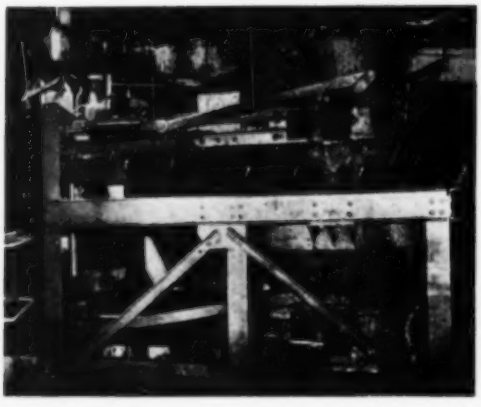
As major moves in altering the plant, 10 SuperDuty Diagonal-Deck washing tables, two Bird filters, a Link-Belt Multi-Louvre drier, two

RAW COAL IN TRUCK BIN reaches belt through a star feeder in each section. Short rails restrict feeder throat. Steam jets and housing allay dust where the run-of-mine belt discharges onto the main shakers.

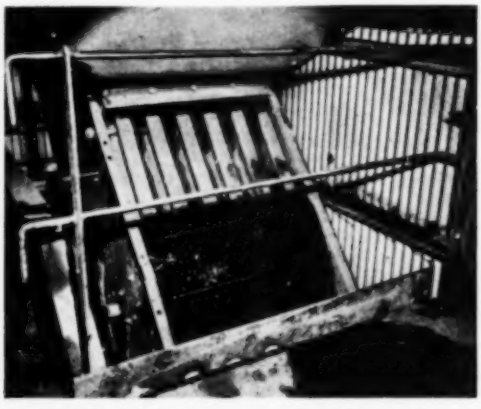
Modernized Cleaning Plant Uses New Equipment to Raise Efficiency



NEW CRUSHER at the end of the main shakers reduces plus 8-in coal and rock to minus 8-in. Now, only one handpicker is employed in the plant to throw out wood, wire and paper. Feed sometimes runs as high as 90% rock.



BUTTERFLY GATES now are used on the cone that cleans 1x1/8-in coal, replacing original sliding refuse gates.



STAR FEEDER and 35-ton refuse surge bin provide continuous full loading for refuse belt, thus boosting capacity.

crushers, eight vibrating screens and a rotary car dump have been installed and many improvements such as rubber pipe, central lubrication and duplicate units have been effected to insure continuous operation and reduce maintenance cost.

The plant operates three shifts. The raw coal fed to it from the company's adjacent mines is supplemented by 3,000 tons per day from small mines with truck haulage on the company's property. All the coal comes from the Elkhorn No. 3 seam. The plant has produced as much as 11,500 tons of cleaned coal in 24 hr, which, based on the present reject of 34%, means that it handled a feed of 17,400 tons.

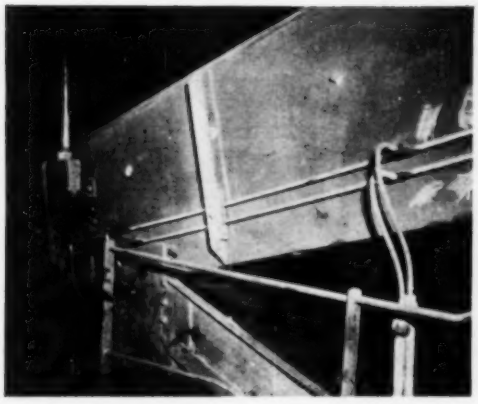
The first change was installation of a primary crusher at the end of the 10x116-ft main shaker screen to reduce the plus 8-in to minus 8-in and eliminate all handpicking except for one man stationed at the end of the shaker to pick out wood, wire and paper. This crusher is a McLanahan & Stone 30x42-in single-roll Rockmaster driven by a 75-hp motor. At times it must crush a feed material as high as 90% rock.

Of the two Chance sand-flotation cones, the one handling 8x1-in was rebuilt to increase the size of the refuse chamber, the column and the refuse elevator. To reduce maintenance of the other cone, which handles 1x1/8-in coal, the old-type slide refuse gates were replaced with new-type butterfly gates.

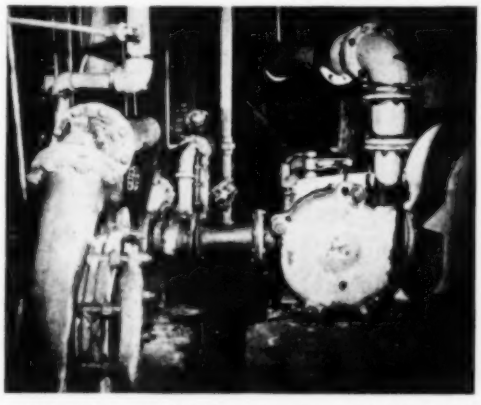
To handle the greatly increased quantity of refuse resulting from full-seam mining, the original 24-in belt conveyor carrying refuse from the plant to a disposal bin high on the opposite hillside was equipped with a 26-in belt. A 35-ton refuse surge bin was installed in the plant, permitting full-capacity end-loading of the belt and thus replacing the original side-loading from four points. This surge bin provides for emergency truck loading in case the refuse belt is not operating. The new refuse feeder is a star type made in the company's shop. Short lengths of rail pivoted at the top hang down over the throat of the feeder and provide emergency relief for clearing unusually large pieces of slate.

An electric larry on the top of the hill, operating between the belt discharge bin and the refuse pile, was displaced by a 15-ton Euclid truck, which now hauls 600 ft. A bulldozer levels and packs the refuse.

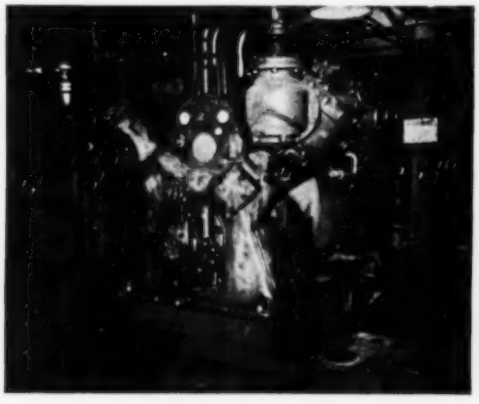
Because of mechanical loading in



CENTRAL LUBRICATION for heavy-duty sleeve bearings includes an efficient pumping unit (left). Flexible hose feeds manifold pipes that lubricate the hanger bearings of the main shaker screen.



TWO PUMPS in series force fine refuse through a 4-in steel pipe 3,000 ft to a hilltop pond against a 301-ft head.



ANGLE-TYPE COMPRESSOR has boosted air capacity for operating valves, gates and maintenance tools.

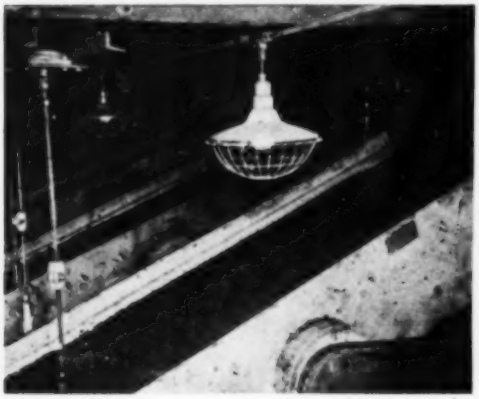
the mines and the need for increasing water on cutter bars, company officials decided to wet-clean the ⅛x0-in coal. Accordingly, 10 Super-Duty Diagonal-Deck tables made by the Deister Concentrator Co. were installed. Nine are in regular use and one serves as a spare.

To extract most of the water from the table-washed ⅛x0-in coal preliminary to heat-drying and to recover very fine coal, two Bird continuous centrifugal filters were installed. These units proved so efficient in trapping fine solids from the water that the extremely heavy clay content in the water of the wet-table product tended to clog the filters. To eliminate this difficulty, two Robins Eliptex vibrators were installed in parallel as dewatering screens ahead of the filters. From these screens the dewatered coal is flushed with clean water into filters, which then reduce the surface moisture to 12 or 13%. Solids in the screens underflow are collected in a cone and are returned to the Birds. Experience with these filters in the central plant has shown that they can recover solids down to 200-mesh and require comparatively little maintenance.

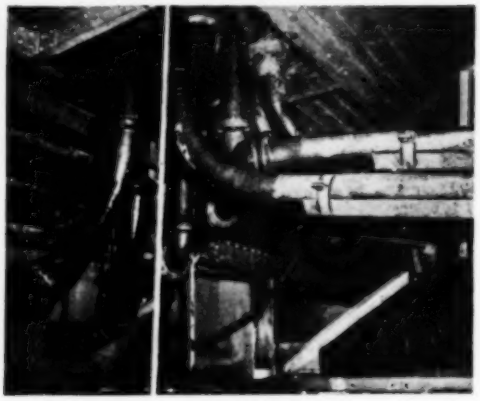
The most recent improvement was the installation of the Link-Belt No. 1224 Multi-Louvre heat drier consisting of two units, each 12 ft wide and 24 ft high. Total rated capacity is 80 tph of ⅛x0-in dried from 15 to 3% surface moisture. Fine coal from the cyclone dust-collecting system of the plant is burned in the air heater supplying the driers. This drying installation, a costly addition to the central plant to turn out a product more acceptable to the customer, has insured better running time to the mines feeding the plant.

Water on cutter bars, together with damp coal from some of the mines, called for improved facilities for separating the 1x0-in raw coal into ⅛x0-in for the wet table feed and 1x⅛-in for treatment in one of the Chance cones. The five original 5x10-ft screens accordingly were replaced by the same number of Link-Belt Type CA 5x14-ft vibrators. A decision to replace all five of the original screens was not made until after one had been installed and its performance observed for several months. This type of CA (concentric action) screen is spring-and-cable suspended and has a balanced two-bearing vibrator mechanism which gives a concentric or circular motion to all

Tables Clean Smallest Sizes in Modernized Plant of Consol (Ky.)

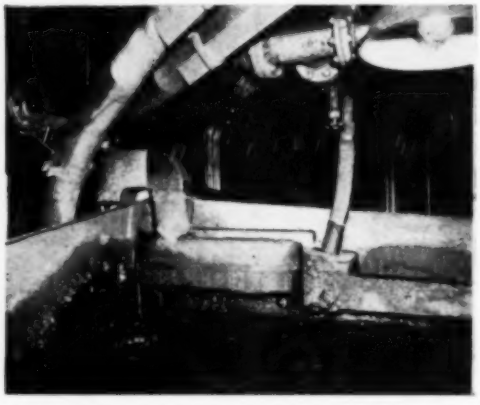


FIVE VIBRATORS, 5x12 ft, use a circular motion to separate 1x0-in raw coal into 1x1/8 and 1/8x0-in sizes.



RUBBER PIPES, supported on long straight runs by steel angles, convey 1/8x0-in coal and water to the tables.

WET METHODS clean the 1/8x0-in coal. Ten tables are installed, nine for regular operation and one for standby.



SPLASH BOARDS of aluminum, rubber feed connections and covered feed boxes help keep table-room floors clean.

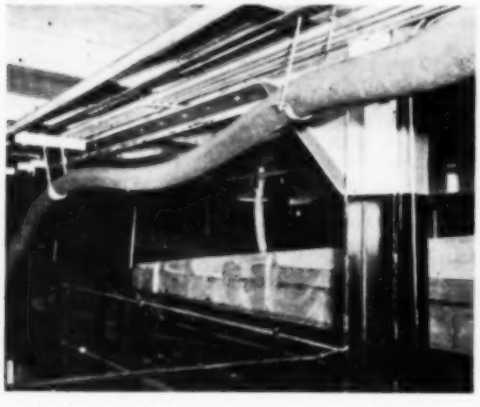


TABLE REFUSE travels from a pump below the tables to dewatering screens through a 200-ft run of 4-in rubber pipe.

CENTRIFUGAL FILTERS take most of the water from table-washed coal prior to heat drying. Also, they recover fines.

parts of the screen, thus separating the two sizes completely.

To gain efficiency in crushing and maintain a closed circuit, a Nordberg vibrator, which already was on hand, was installed to screen the product from a primary crusher and divert the oversize to an American ring crusher for secondary reduction.

Steam Jets Reduce Coal Dust

Coal-dust control in the plant was materially improved by installing steam jets at several points. The discharge from the 54-in run-of-mine belt to the main shakers was boxed in and steam jets were placed along the top of the open end above the screen. The steam from five $\frac{1}{8}$-in holes in a 1-in pipe header forms a dust curtain which slopes inward so that little or none of the steam escapes through the opening. Pressure at the feed end of the header is 80 to 90 psi.

To save steam and avoid the ill effects of too much moisture, the jets are turned on and off automatically by a solenoid valve connected into the electrical control circuit of the screen. A header and similar jets have been installed where the 1x0-in from the main shaker drops into the kickback chute. Each crusher also is equipped with a steam jet.

Table refuse is dewatered on a Robins vibrator. The larger sizes go to the main refuse belt and the extremely fine sand and refuse is pumped to a settling pond on the hill and back of the refuse pile. The sand in this refuse comes from the Chance cones, the silt from which is run over the tables to recover any fine coal which might be included.

Because of this sand and other abrasives in the table feed, all 4-in pipes from the distributor to the tables are rubber, made by Goodyear and called Diversipipe. On the long straight runs they are supported in troughs consisting of 3x3-in angles.

Characterized by better wearing qualities, rubber pipe has replaced steel or cast-iron pipe wherever refuse is handled in the plant. A 4-in rubber pipe 200 ft long carries the table refuse from a Wilfley pump to a dewatering screen ahead of the refuse surge bin. Proof of the long life of rubber pipe has been provided by an 8-in line which was installed when the plant was built in 1942 and which has been handling sand and water ever since without renewal.

To increase the capacity of compressed air used for operating valves, gates and maintenance tools, the original plant compressor was replaced with a Joy (Sullivan) Model C Class WN-112 unit driven directly by a 75-hp motor. Size is $11\frac{1}{4}$x7x7 in; speed, 600 rpm; and maximum rated pressure, 125 psi. This machine uses little floor space and its smooth operation foretells low maintenance cost.

To keep the table-room floor as clean and dry as the rest of the plant floor area, the tables were equipped locally with aluminum splash boards, feed boxes and flexible rubber feed connections. The dry clean floor has a good effect on workers and of course saves clean-up expense.

Sludge and fine refuse is pumped up onto the hill to the settling pond through 3,000 ft of 4-in steel pipe with Victaulic couplings. The first installation consisted of two Goyne pumps in series, both located in the plant basement and working against a total head of 301 ft. Following a policy of having duplicate pumping units throughout the plant, another 4-in steel pipe with Victaulic couplings was laid from the plant to the pond and two 600-gpm Wilfley pumps were installed, also in series. However, one pump was placed in a station halfway up the hill. One of the Goyne pumps is scheduled to be moved later to this halfway point.

Lubrication of heavy-duty sleeve bearings as installed on the main shaker was troublesome both in operation and in maintenance. A centralized system, made by the Farval Corp., Cleveland, Ohio, was installed and is operated from one reservoir and pumping units. Flexible hoses connect stationary pipes with the moving distribution pipes on the shaker screen. Metering devices at individual bearings are adjusted to suit the particular needs of each. The pump drive consists of a 1-hp Tri-Clad General Electric motor.

End-Loading Adds to Belt Life

As mentioned earlier, the refuse belt from the plant to the hilltop now is end-loaded instead of side-loaded. This arrangement, it is expected, will increase the belt life. The original 24-in belt did very well, however, having served six full years, much of which was triple-shift operation. That period marked the change from hand-loading to mechanical loading and full-seam mining, with a tremendous increase in refuse to be handled.

For retail sales of washed coal, new facilities were added to the plant. These consist of a belt conveyor across a highway and two 100-ton silo-type concrete storage bins with lowering spirals. One is for furnace coal and the other for stoker. Also a truck scale and weigh house were installed close by.

When the plant was built in 1942, the mine bottom, from which the 54-inx758-ft belt conveyor delivers to the plant, was equipped with two crossover dumps to handle the old-style $2\frac{1}{2}$-ton lift-endgate steel cars. Recently in one of the mines the old cars were replaced with 150 new 8-wheel 10-ton Differential Steel cars. This change called for installing a rotary dump instead of one of the crossover dumps.

High-Speed Truck Dumping

For handling the coal hauled by trucks from a number of small mines, a 1,000-ton wooden dump bin was built on the hillside below the plant. This bin is long and narrow, affording space for simultaneous dumping of 10 large trucks or 14 small ones. The large trucks are 11-ton KB8 Internationals and the smaller ones are various types averaging about $7\frac{1}{2}$ tons each.

The belt which elevates from this bin to the run-of-mine belt feeding the shaker screen extends along the lower side of the bin for its entire length. Fifteen star feeders side-load the truck coal to this belt. The feeders are driven from a line shaft through clutches so that the operator can engage those at sections where trucks have dumped. The line shaft is driven by a two-speed motor with Link-Belt P.I.V. variable-speed gear connection. The whole arrangement affords a maximum flexibility.

A 40x120-ft Quonset building was erected close to the plant to provide convenient space for coal-sample preparation and storage of calcium-chloride and heavy spare equipment. In addition, it includes an oil-storage room and a "bullpen" where the car droppers can come in to get warm and dry their clothes.

Another improvement was the installation of a central laboratory equipped to serve all the mines of the company. The laboratory is conveniently located on the hillside adjacent to the plant. Float-and-sink tests, proximate analyses and also mine-air and mine-dust analyses are made in this building. The laboratory's work also includes Btu and ash-fusion-temperature tests as well as analysis of cores from test drill holes.

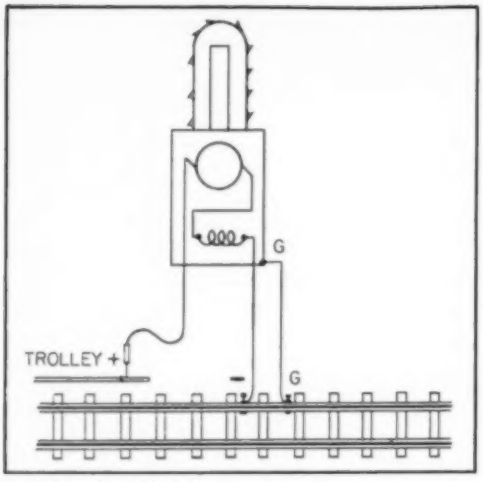


FIG. 1—CONVENTIONAL grounding of a mining machine.

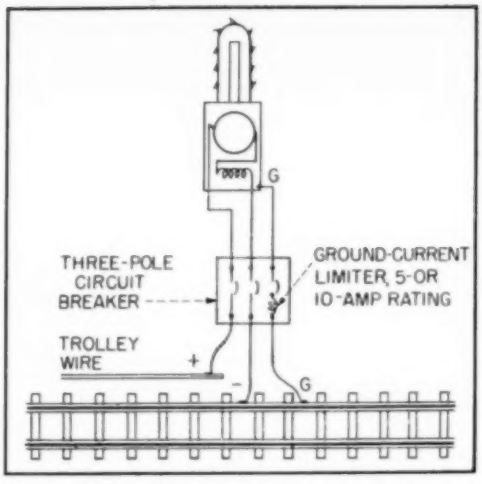


FIG. 2—GROUNDING through circuit breaker and grounding relay.

Grounding Mining Equipment

The Grounding Problem With Both AC and DC Equipment Underground and in Open-Pit Mines — Types of AC and DC Grounding Systems and Their Advantages and Disadvantages — Maintenance of Grounds

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PROTECTIVE GROUNDING of electrical equipment is vital to the preservation of life as well as to the proper functioning of protective electrical devices. Electrical systems endanger life because of the occasional entrance of abnormally high voltages into the low-voltage parts of electric circuits and equipment. This is a result of faults in insulation between high- and low-voltage circuits.

Such faults arise for the most part from lightning and breakage of wires and, occasionally, from high-voltage surges or deteriorated insulation. However, it must be remembered that the principal hazard in underground electrical systems and associated electrical equipment results from insulation failures with both ac and dc voltages below 600, rather than from entrance of higher voltages.

The primary function of grounding is to increase the safety of both persons and property. Its secondary function is to aid in system operation. Generally, these two functions are complementary and compatible but, in some instances, the advantages of grounding are debatable and in others grounding may be hazardous. It must be recognized at the outset that grounding is not a cure-all. It cannot eliminate all hazards. It reduces them in some instances and increases them in others. No general rule can be written to take the place of sound judgment based on experience.

Rules can be established for grounding certain electrical systems and equipment, but there may be instances where the rules for grounding the system do not coincide with those for grounding the equipment. However, if the primary function of grounding is to increase the safety of persons and property, then the principal problem is to make certain that the grounding of the electrical system is suitable for the grounding of equipment connected thereto.

Grounding electrical systems and equipment in the mining industry is not as easy as it may appear, particularly when compared to other industries where equipment is more or less stationary. A large plant or factory may use ac throughout and employ the grounded-phase system for grounding equipment. Moreover, the equipment is installed in a permanent manner and is stationary. Such a system does not subject the equipment grounding conductors to severe mechanical abuse.

In the mining industry, on the other hand, much of the equipment is portable and is connected to the power source by long multiple-conductor trailing cables equipped with safety-grounding conductors. Then there are mobile mining units fitted with power-driven reels to permit the reeling and unreeling of the trailing cables. If the trailing cable is equipped with a separate conductor for grounding the machine frame, a severe strain may be imposed upon the grounding conductor while the machine is being moved. Consequently, the problem of grounding equipment in the mining

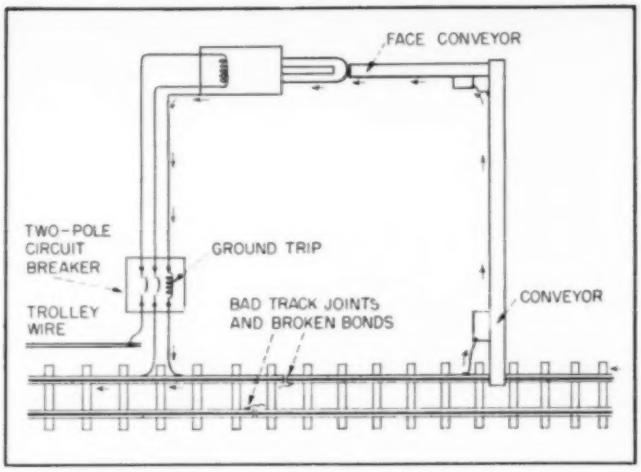


FIG. 3—GROUNDING with individual machine protection in room work.

industry is mechanical as well as electrical.

In any grounding system it is desirable that the grounding medium be low in resistance. However, in some sections of the country such a low value cannot be obtained. In any event, the principal ground should be as low in value as possible. At most mines, a good grounding station can be established on the surface by testing the ground resistance of the earth with a reliable ground-testing instrument. This station can be connected to the system-grounding conductor and extended underground to the metal frames and casings of electrical equipment. Such a practice is general at mines utilizing ac power for the operation of mining equipment underground.

At mines using a track-haulage system it is common practice to use the rail, not only as a power conductor but also as a grounding medium. The track is suitable for grounding, primarily because it contacts the surface or mine floor at numerous places throughout the mine and establishes what might be compared to a low-resistance grounding network on the surface.

If the mine track is considered a good grounding medium, equipment operated on the track can be considered grounded and need not be connected to the track with a grounding conductor, unless the grounding effect is destroyed by extraneous materials such as sand, coal or mine refuse under the wheels.

Electric mining equipment operated off the track, such as conveyors, mining machines, loading machines, shuttle cars, drills and pumps, is generally frame-grounded by continuous electrical conductors between the track and the machine frames.

The old practice of grounding off-track electrical equipment by connecting a short "jumper" from the negative conductor to the machine frame has proved hazardous in many instances. Investigation of such installations reveals that a harmful electrical condition exists when the negative connection is broken or the metal frames of underground electrical equipment come in contact.

It is frequently the practice in coal mines to connect the frame-grounding conductor and the dc return conductor to the track at a common point. This is no different from the old negative-to-frame "jumper" method. If the connection at the track is broken, the machine frame can become charged at line potential.

In addition to grounding from the man-safety standpoint, modern mining-electrical systems include ground-fault protective devices to detect failures in electrical equipment and cables before a serious breakdown occurs. Such modern systems generally include a grounding conductor in conjunction with an adequate circuit breaker and suitable tripping relays.

Tests with ground-fault tripping devices were conducted at a few mines in the bituminous coal fields several years ago. These tests aroused the interest of many mine electricians and company officials. When these tests, under actual mining conditions, were completed, it was found that a suitable air circuit breaker incorporating a ground-tripping relay could be manufactured and made available to the mining industry for improved protection.

Today, many grounding systems employing ground-tripping devices in conjunction with high-speed circuit breakers are in use in both deep and open-pit mines. Ground-fault protection on low-voltage dc and ac systems is obtained by a current-limiting relay inserted in the grounding circuit. The current rating of this relay is generally fixed at 5 or 10 amp, depending upon the characteristic of the circuit to be protected.

Fig. 1 shows one of the more common methods of grounding the frames of dc machines. A copper conductor is connected to the machine frame and to the mine track or other grounding medium. This method of grounding has been rather successful in the past and today is employed in many mines throughout the country. However, one of the principal disadvantages is that a ground fault of low intensity, say 100 amp, will not be sufficient to blow a fuse or open a circuit breaker with a current rating or setting of about 200 amp.

Circuit-Breaker Correction

Such a condition can best be corrected by using a circuit breaker equipped with a small current-limiting relay in the grounding circuit. Fig. 2 illustrates a typical set-up with the three-pole breaker. A fault in the mining-machine circuit of sufficient intensity to operate the ground trip will cause the circuit breaker to open, thereby eliminating a potentially destructive arc in a motor or cable before it can do any serious damage.

When two or more machines are operated in a room and where individual circuit protection is provided with two-pole breakers, it is possible to damage the ground-trip relay if the grounding circuit is not opened when an excessive current flows over the grounding circuit. Fig. 3 illustrates a condition where the dc return from a track system passes over a conveyor and thence over the grounding circuit of the mining machine and over the

AC Grounding—Methods, Equipment and Advantages and Disadvantages

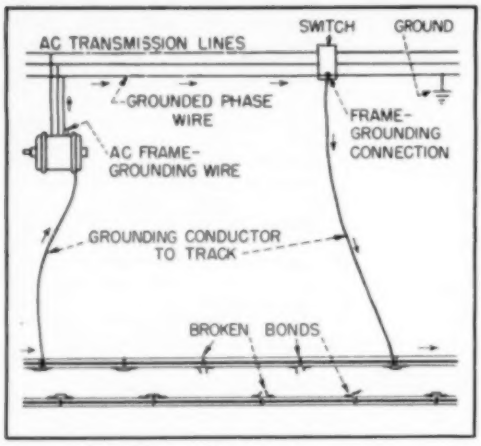


FIG. 4—GROUNDED PHASE and track circuit interconnected. Hazardous because dc can return over the ac system.

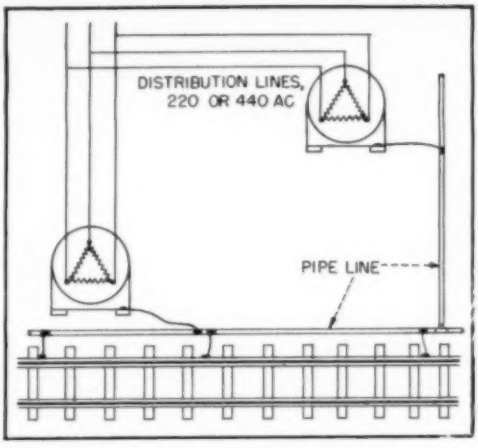


FIG. 5—THREE-WIRE DELTA-CONNECTED SYSTEM without system-grounding conductor. Dc can return over the ac system.

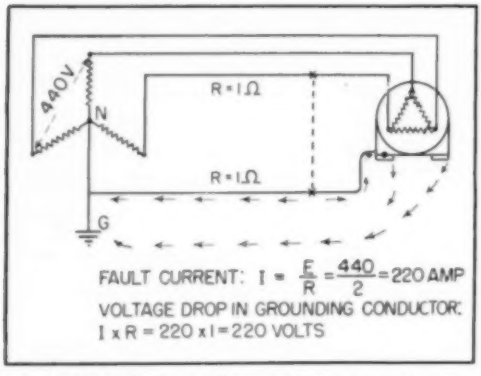


FIG. 6—GROUNDING with Y-connected secondary and system-grounding conductor connected to transformer neutral.

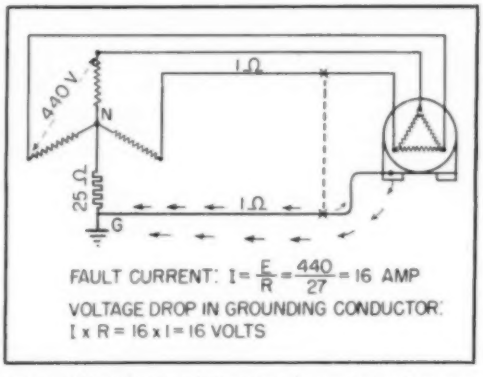


FIG. 7—GROUNDING with Y-connected secondary and current-limiting resistor in the grounded neutral at the transformers.

ground-trip coil. Such coils are designed to carry current for very short periods only and will not withstand continuous overloading. Consequently, it is desirable to use a three-pole breaker with one pole in the grounding circuit to provide protection for the coil in the ground-current limiting relay.

Grounding AC Systems

The grounding of ac systems involves various problems too numerous to discuss in an article of this length. However, the following are typical cases of safe and unsafe practices.

Generally, the electric current at mines using ac for the operation of mining equipment underground is transmitted at 4,160 or 2,300 volts. Modern high-voltage transmission systems employ cables similar to those used with electric shovels at strip mines. An example is SH-D cable, which has individually shielded conductors with three ground wires in the interstices between the three power conductors. The shielding over the insulation of the conductors provides protection against corona and, together with the ground wires of the cable, provides a suitable means of grounding the system. Such cables generally are used to conduct the high voltage ac from the surface transmission lines through boreholes and passageways to the substations underground.

HIGH-VOLTAGE AC SYSTEMS—Several methods have been employed for grounding high-voltage systems. However, it must be recognized that the method of grounding one system may not prove satisfactory for another. Before any grounding system is adopted, it should be investigated thoroughly to make certain that is will provide the desired protection.

One method employs a four-wire Y-connected grounded-neutral system with an overcurrent tripping device to open the main circuit breaker in the event of a ground fault in the system. This method depends upon phase-to-neutral voltage to trip the circuit breaker. However, the system does not limit the fault current, and a person could be electrocuted in the short time that it takes to interrupt the circuit.

The second method is somewhat similar to the four-wire Y-connected grounded-neutral system except

that is possesses additional safety features. Such a system has been adopted for grounding in open-pit mines, and is given in detail in Figs. 11 and 12. The main-transformer secondary is Y-connected and the fourth wire, or system-grounding conductor, is connected to the neutral point of the transformer windings. A special circuit-breaker unit, which incorporates current and potential transformers, overcurrent phase relays and overcurrent ground relay, is generally used in conjunction with this system.

The neutral of the transformer secondary winding is connected to the system-grounding conductor through a grounding resistor. This resistor should be capable of carrying the maximum ground current continuously so that it will not burn out and lose its protective features. The value of the grounding resistor should be such that it will limit the voltage drop in the system ground to a value that will not be dangerous to persons touching the equipment, at the same time permitting the protective devices to function.

The third method consists of a four-wire delta-connected system with a system-grounding conductor originating on the surface. It is generally used at ac operations throughout the country and is somewhat effective in handling normal current leakage. However, a heavy fault current on the system could be hazardous, considering the voltage drop in the system and also the destructive effect it could have upon earthed grounds. A continuous fault current on the system ground could cause heating of the main ground, thereby increasing its resistance and imposing a portion of the fault current on the frames of equipment connected to the system ground.

LOW-VOLTAGE AC SYSTEMS—Low-voltage ac systems underground usually are either 440 or 220 volts. Some mines operate solely on ac, while others use both dc and ac equipment. Several different methods of grounding are employed, some of which will be discussed briefly.

The system shown in Fig. 4 is known as the grounded-phase system in which one phase wire is solidly grounded to earth. Such a system is employed in some mines and industrial plants and has proved very effective. However, this system when adopted in coal mines can be hazardous if the grounded phase and the frames of equipment are grounded or bonded to the track of a dc system. High-resistance connections in the dc track circuit, as a result of a broken rail or bad bonding, will cause a portion of the dc power to return over the ac grounded-phase wire. Such a condition could cause overheating of the ac ground wire and destroy the insulation around the conductor. If this conductor was built into a multiple-conductor cable, it could cause destruction of the cable. In addition, this method of grounding could cause a man to be shocked while working on an ac system from which the ac power had been cut off.

A second method shown in Fig. 5 consists of a three-wire delta-connected system without a system-grounding conductor and is in general use at coal and metal mines throughout the country. Grounding of equipment in such a system is generally accomplished by connecting to the mine track, water lines or grounding electrodes. This method of grounding proves satisfactory so long as the grounding medium is sufficient to withstand sustained ground-fault current. However, the system can become hazardous when a ground fault occurs on one phase of two or more pieces of equipment grounded to the track circuit of a dc system. This condition simulates the ground-phase system and would, under certain conditions, permit the flow of dc over the ac power conductor as a result of poor connections in the dc return circuit.

Figs. 6 and 7 show methods of grounding systems with Y-connected secondaries. The scheme in Fig. 6 involves connecting the fourth wire, or system-grounding conductor, to the transformer neutral. This system produces a heavy fault current under ground-fault conditions and relies on this current to trip the circuit breaker. Although the heavy fault current should cause the overcurrent relays to trip the circuit breaker, a dangerous voltage may be present between the motor frame and ground during the short interval of time required for these devices to function.

It should be remembered that with the solidly grounded neutral a ground fault on any phase wire in the distribution lines will cause the potential of the ground wire to rise above earth potential by the amount of the voltage drop in the grounding circuit, and the potential of any machine frame or other apparatus connected to the ground wire will rise above earth potential by approximately the same amount. Generally, this voltage cannot be held low enough for safety, even with multiple grounds installed along the line at numerous points to make the resistance of the ground connections as low as practicable.

Fig. 7 shows a four-wire grounding system with a current-limiting resistor in the grounded neutral at the transformers. The goal is to limit the ground-fault current to such a value that the potential rise of the machine frame above ground, equal to the voltage drop in impedance of the grounding connection, will not exceed a voltage ordinarily considered dangerous to human life. Although this method of grounding is effective in limiting the voltage and current to safe values, it will not always open the circuit breaker under ground-fault conditions unless a current transformer and overcurrent ground relay are included in the grounding circuit.

Grounded-Neutral Systems

Values for fault current and voltage drop in the grounding circuit under fault conditions are given in Figs. 6 and 7. With the solid-grounded-neutral system shown in Fig. 6, it is possible to obtain 220 amp and 220 volts under fault conditions. By inserting a 25-ohm current-limiting resistor in the grounded neutral at the transformers it is possible to limit the fault current to 16 amp and the voltage drop to 16 volts. In both examples it is assumed that the resistance of the grounding conductor is equal to that of the power conductor, each 1 ohm, resulting in a total circuit resistance of 2 ohms in the event of a failure on the machine.

Since the majority of the distribution transformers underground have delta-connected secondaries, it becomes necessary to establish a neutral point for grounding at the transformer secondary. This generally is accomplished by installing grounding transformers on the secondary side of the distribution transformer. Fig. 8 shows such a method of grounding low-voltage systems. Three single-phase dry-type transformers (1½ kva each, 460-230/230-110 volts) are used for this purpose. The primaries of the transformers are connected in star and the neutral point is connected to the desired solid ground. The secondaries of the transformers are connected in closed delta and have

Open-Pit Grounding—Methods, Equipment and Comparative Features

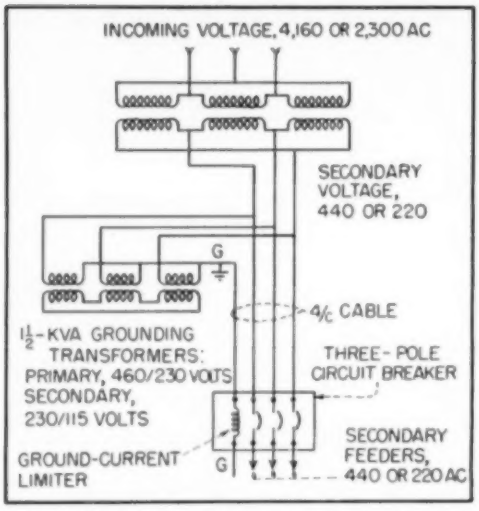


FIG. 8—GROUNDING low-voltage systems with grounding transformers on the secondary side of the distribution transformer.

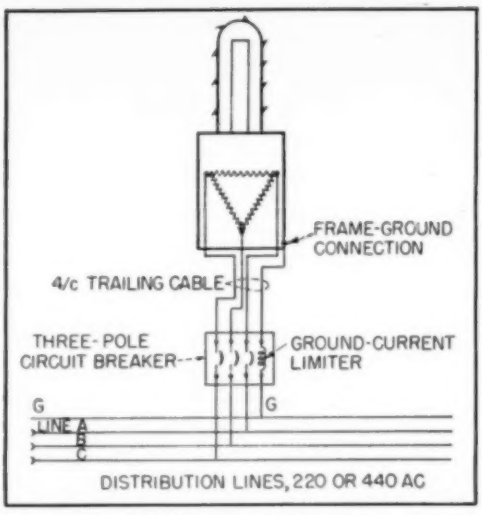


FIG. 9—GROUNDING AND CONNECTING room circuits to feeders with three-pole breaker and ground-current limiter.

no other connections in the system.

With this method of grounding no current should flow in the secondary of the grounding transformers during a balanced condition, as all currents will balance and total zero in any part of the circuit. In a balanced-phased condition without ground there should be no current flowing in the neutral of the primary. The current in the primary legs of the grounding transformers will total zero at the neutral point.

In the event one leg becomes grounded and an unbalanced condition exists across the grounding transformers, current will flow through the neutral. The amount of current flow, however, will depend upon the impedance of the ground fault, grounding conductor and other elements of the grounding circuit. Assuming a 440-volt system, this would establish approximately 253 volts ground to any phase. On a 220-volt system, the voltage from line to ground would be approximately 127 volts.

The continuous rating of the grounding transformers is estimated to be approximately 3.4 amp without damage to the windings. Momentary ratings of the primary for a duration of 1 min or less are in the neighborhood of 30 amp.

Fig. 9 shows the method of grounding and connecting rooms circuits to the distribution feeders. A three-pole automatic circuit breaker with a 5-amp ground-current limiter is installed in the room circuit near the point of connection to the distribution lines. With this type of installation the room circuit breaker will be opened instantly upon the occurrence of a ground fault in the mining machine or the trailing cable.

Original installations of such systems did not provide selective tripping under ground-fault conditions. For example, a ground fault in the room circuit would trip the circuit breaker at the transformer station in addition to the breaker at the room. It was thought at first that a 5-amp ground trip on the room breaker and a 10-amp trip on the breaker at the transformer station would be sufficient to provide selective operation under ground-fault conditions. However, after numerous tests under actual operating conditions, it was learned that, occasionally, fault currents were in excess of 1 amp. When a ground current exceeding 10 amp flowed through the ground trips, both breakers opened instantly and it was then necessary to travel several hundred feet to the circuit breaker at the transformers to restore service.

Modern systems employing automatic circuit breakers and ground-current relays generally are provided with a time-delay ground trip at the main breaker near the transformer station. A time delay of ½ to 1½ sec in the trip action of the breaker at the transformers will permit the room breaker to open upon ground fault, provided, of course, the fault is in the room circuit. On the other hand, if the fault is in the entry feeder cable, the circuit breaker at the transformer station will open within the pre-set time delay.

Strip-Mine Grounding

Electrically-operated shovels, draglines and similar mobile machines have been in use for many years and safety has been a prime consideration in most industries employing such equipment. However, only in comparatively recent times has there been any general recognition of the likelihood of dangerously high voltage appearing between the machine and ground as a result of a ground fault on the distribution circuits.

When electric power first came into use for shovels, the portable cables developed had only the three conductors. No provision for ground connections was made, as it was presumed that the shovel would be well grounded by the heavy pressure and the large tread of contact with the earth. This proved incorrect, however, and under many conditions, as with the shovel resting on a rocky or sandy surface, the contact resistance may be so high as to virtually isolate the shovel from the ground.

With the development of the three-conductor cable with copper shields around the insulation of each of the three power conductors, advantage

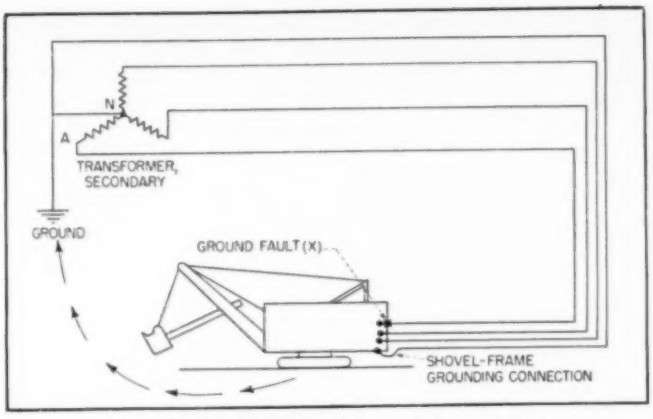


FIG. 10—GROUND FAULT on solidly grounded neutral system.

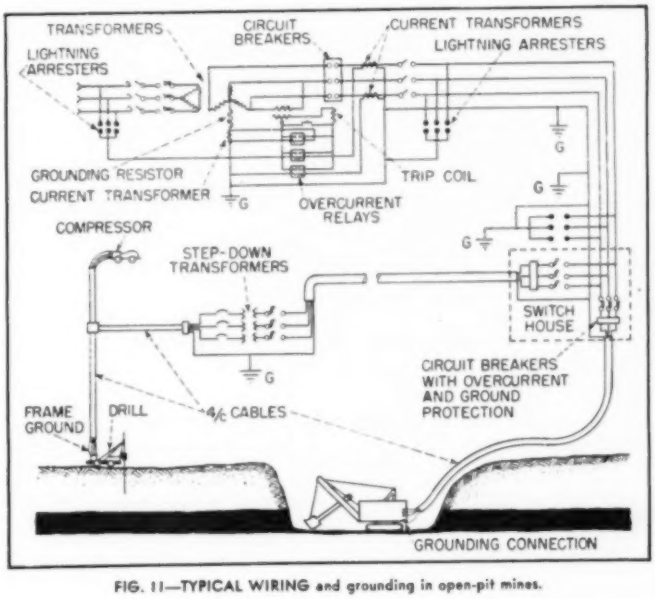


FIG. 11—TYPICAL WIRING and grounding in open-pit mines.

was taken of their presence to connect the shovel frame to a grounding station at the other end of the cable or, where Y-connected transformers were used, the cable shields were connected to a ground wire in turn connected to the transformer neutral. Such connections as these, though still used in some mine-distribution systems, do not afford adequate protection against the hazard of high voltage between the shovel frame and ground in the event of insulation failure.

For example, in the case of a short circuit between one line and the shovel frame where a solidly grounded neutral is being used, as in Fig. 10, assume that the impedance of the grounded power line, from A, at the transformer, to X, the point of ground fault at the shovel, is the same as the impedance of the ground-return circuit from the point of short circuit, X, to the transformer neutral point, N. Assuming that a 4,160-volt Y-connected transformer bank is in use and that normal voltage is maintained under short-circuit conditions, then the 2,400 volts supplied by the transformer leg under short circuit is dissipated in the circuit from the transformer to the shovel and the ground return.

This involves a potential drop of 1,200 volts in the line X-A and 1,200 volts in the ground return. It is evident, then, that the shovel frame is at a potential 1,200 volts above that of the transformer neutral. If the shovel treads are on insulating rock and a man touches the shovel structure while standing on conducting earth, which will be at the potential of the transformer neutral point, he will be subjected to the 1,200-volt potential gradient between the shovel frame and the transformer neutral point.

On the other hand, the shovel need not necessarily be on insulating rock to produce a serious voltage gradient between the frame and earth. If high ground currents exist on the shovel frame, a high voltage gradient in the surface of the earth in the vicinity of the shovel is probable. This gradient can seriously shock a person whose feet are so placed on the earth surface as to span a difference of potential.

High-Voltage Shock Possible

Although the heavy fault current should cause the overcurrent relays to trip the main circuit breaker, a dangerous voltage may be present between the shovel and ground during the short interval of time required for these devices to function. A man standing on the ground and touching the shovel at the time the fault occurs may, therefore, be subjected to a high voltage for enough time to cause severe injury or death.

With the increased use of electrically-operated power shovels in open-pit mining, the solidly grounded neutral system produced a shock hazard that has resulted in numerous electrocutions. Consequently, it was necessary to develop a method of grounding that would not permit sufficient voltage between the shovel frame and earth to result in a shock hazard. The system developed is known as the impedance grounded neutral system.

Fig. 11 is a schematic diagram of an impedance-grounded distribution system for an open-pit mine. Power, as received at the main pit substation, is reduced by the delta-Y-connected transformers to either 4,160 or 2,300 volts. The pit substation equipment consists of transformers and overload- and ground-protective devices. Lightning arrestors and disconnecting switches

are installed in the incoming and outgoing circuits.

The neutral of the transformer-secondary winding is connected to the system-grounding wire through a grounding resistor. This resistor should be capable of continuously carrying the maximum ground current so that it will not burn out and its protection be lost. The value of the grounding resistor should be such that it will limit the voltage drop in the system ground to a value that will not be dangerous to persons touching the equipment and at the same time permit the protective devices to function.

Some installations utilize a resistor having a current rating of 25 amp, whereas other installations use a higher-value resistor rated at 45, 50 or 55 amp. The principal reason for using the higher-value resistors is to obtain the necessary current for reliable operation of a selective ground tripping system for all the circuit breakers.

The substation circuit breaker is equipped with a trip coil controlled by the overcurrent phase relays and a grounding relay. A ground fault within the system will cause the grounding relay to function and trip the circuit breaker; also, short-circuit protection is provided through the overcurrent phase relays.

The frames of all shovels and other mobile equipment supplied from the main distribution lines are connected to the system ground. The system ground wire is connected to the substation ground and to other grounds at or near cable taps and at intervals along the line, with a sufficient number of ground connections to obtain the lowest possible resistance to ground.

Another scheme, shown in Fig. 12, is commonly used where selective tripping is desirable. This arrangement is helpful where more than one machine is operated from the same system. In this scheme, too, phase-current transformers are used in two of the high-voltage power conductors, and one current transformer is used in the grounding circuit. Selection of the proper-ratio current transformer depends upon the load currents required. The current transformer in the grounding circuit should be of proper capacity to assure sufficient tripping energy for the breaker.

CT Variations

Some of the modern schemes use three current transformers instead of two, or one in each of the phase wires. This is to guard against the possibility of stray ground currents by-passing the grounding circuit.

In some instances, a current transformer called a "doughnut" transformer is used in conjunction with two phase-current transformers. This transformer is used to operate a standard induction relay and has proved very satisfactory when applied at the main substation or at distribution stations along the system. Fig. 13 shows a scheme using the doughnut transformer and induction relay.

This article summarizes grounding practices employed by some mines throughout the country. However, it is conceded that there may be other methods that are more effective. Grounding of systems and equipment is not merely something to be done to keep up with the other fellow. It is intended to prevent personal injury from electric shock through contact with metallic frames, casings and other parts that can become "alive" through a failure of insulation or by contact with energized parts.

Placing a grounding conductor on a piece of equipment is by no means the complete solution. Before equipment is grounded, the electrical system and equipment and the manner in which it is to be operated should be studied. The main ground should be permanent, should be protected against accidental destruction and should have as low a resistance value as possible. Grounding stations, grounding conductors and ground connections should be checked frequently by a competent person with a reliable ground-testing instrument.

Grounding conductors are safety chains and should not be used to carry power, except for power produced through a ground fault. The grounding conductor should be of sufficient capacity to handle the ground-fault current and of sufficient strength to resist breakage from mechanical strain. Ground-fault protection with a broken ground wire is about as effective as a fire engine with a broken hose. The fireman should test the hose periodically and ground circuits also should be tested periodically. The tests should include ground-resistance measurements on grounding stations and grounding conductors and on the frames of electrically driven machines, as well as operating tests of the protective devices.

A well-engineered grounding system, properly installed and maintained, is of primary importance if grounding is to fulfill its purpose as a safeguard.

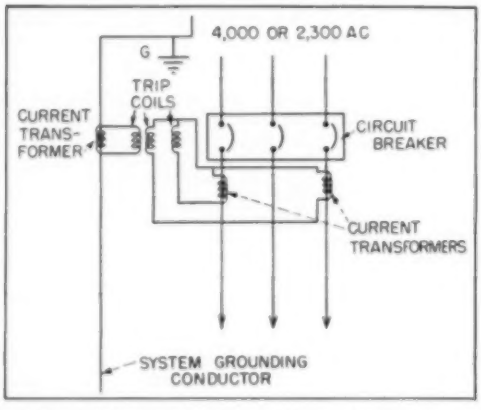


FIG. 12—SELECTIVE TRIPPING on high-voltage branch circuits.

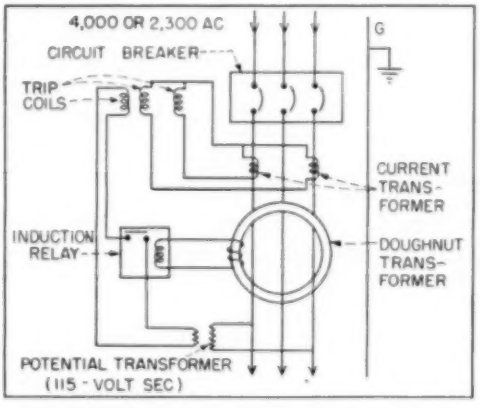
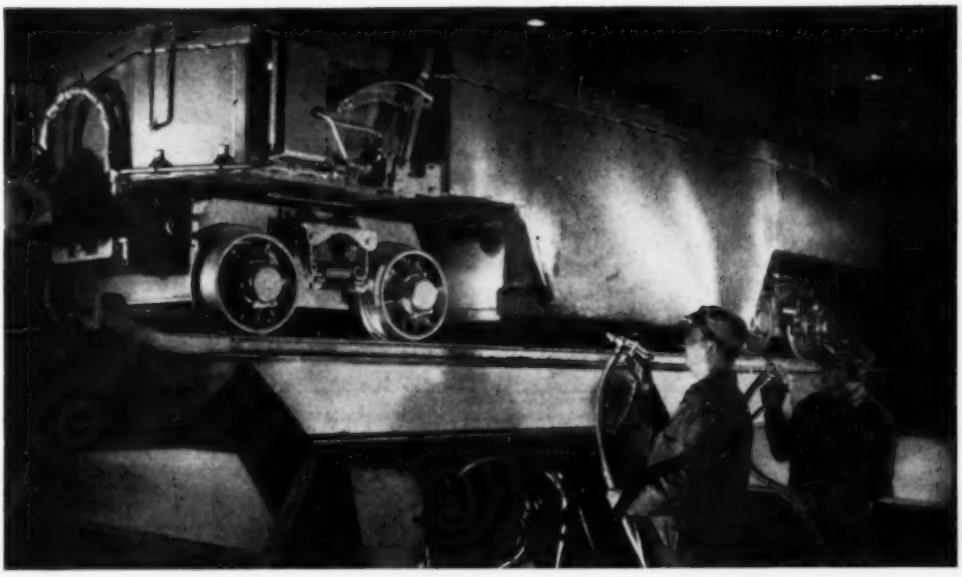


FIG. 13—USING doughnut transformer and induction relay.



PAINT WILL LAST LONGER on this mine car because high-strength steel promotes adherence and retards flaking caused by corrosion.

High-Strength Steel Today

Weight Saving Original Goal in Developing High-Strength Steel—Now Paralleled by Resistance to Corrosion and Abrasion — Mining Applications Offer Savings Through Reduced Equipment Weight and Longer Life

By E. K. WALDSCHMIDT
Special Representative, High-Strength Steels
Jones & Laughlin Steel Corp.

THE MODERN TREND toward greater economy in the use of steel is finding full expression in the manufacture of mining, haulage and transportation equipment. In many applications where mild-steel construction has been traditional for many years, a transition to high-strength steel is becoming more necessary with changing economic conditions and is progressing more rapidly on a wider scale. Resourceful product engineers and designers are applying the special properties of these steels to lengthen service life and reduce equipment repairs, while maintaining low production costs.

Primarily, these things are being accomplished by taking advantage of the weight-saving features of high-strength steel to make more units per ton of steel, at least partially offsetting its higher cost compared to mild steel. Using high-strength steel, engineers are reducing sections formerly made of mild steel by as much as one-third in weight, thereby reducing dead weight and retaining equivalent or greater strength. The reduction of section is comfortably protected by the superior corrosion- and abrasion-resisting properties of high-strength steels.

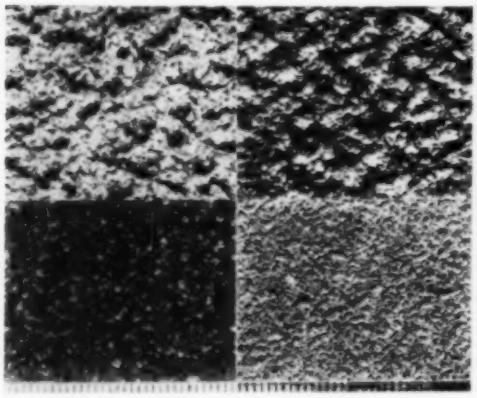
With rising freight costs and the fob-mill system of steel distribution, manufacturers have intensified their efforts to reduce the weight of shipments per unit of production, both to and from the manufacturing site. More units produced per ton of steel means freight savings on each unit. During production, it means less weight of steel handled per unit manufactured.

Weight saving was the original goal in the development of high-strength steels. It has paid off in the elimination of dead weight and capacity for greater pay load. Widespread application, however, developed concurrently in two other fields of production: (1) those in which greater strength for equivalent weight is required; and (2) those in which corrosion and abrasion resistance are of primary importance.

This is particularly true in the manufacture of equipment for mining and transportation of raw materials. Coal and certain other raw materials are handled under highly corrosive conditions. The service life and operating cost of much mining equipment are determined primarily by their ability to resist corrosion.

To withstand corrosive attack, the use of high-strength steel ap-

High-Strength Steels Prove Effective for Varied Applications

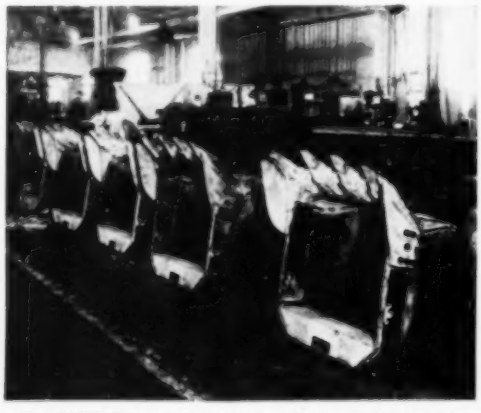


CONTRASTS IN CORROSION. Upper strip shows carbon structural steel with residual copper after two years' exposure—left, rust in place; right, rust removed. Lower strip shows high-strength steel exposed at the same time. Scale divisions are 1/32 in. High-strength steel in truck body (right) is readily welded with mild-steel rods. Welds stand up under severe impact and fatigue.

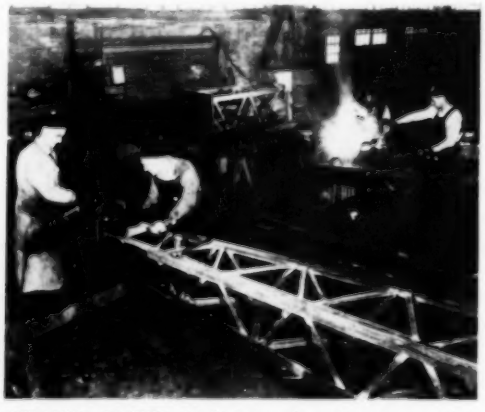
HIGH-STRENGTH STEEL lengthened drying-pan life to 10 months of continuous use —much longer than formerly secured.

COLD-FORMING chain-conveyor pans of high-strength steel, one of its many applications in mining.

RELATIVELY UNCORRODED "tank-top" in freighter service four years contrasts with five-year corrosion of side plates.



HIGH-STRENGTH instead of carbon steel permitted cutting thickness of back and side plates on shovel dippers.



REPLACING CARBON with high-strength steel permits use of a larger dipper than otherwise could be supported by these booms.

pears to be a most effective and economical answer at this time. Its corrosion resistance is provided by a thin powdery film of rust adhering to the steel and forming a protective coat which retards continued corrosive attack. High-strength steel is vastly superior to mild steel, which has a loose porous rust that tends to accelerate corrosive action once it is under way.

Coal-drying pans in a coke by-product laboratory are an example demonstrating this quality. As the moisture is driven out of the coal by the heat, it actively attacks and corrodes the pan.

This by-product lab used pans made of galvanized mild steel until a few years ago, when they tried Otiscoloy. The average service life was approximately 10 months of continuous use—much longer than galvanized mild steel in this application. Otiscoloy is now used exclusively as a result of this experience.

Mine Use Combats Corrosion

Results such as this have been amplified on a much larger scale in the use of high-strength steel for coal conveyors, mine cars, dump trucks, shovels and cranes, railroad hopper cars, barges, and coastal and lake freighters. In each of these underground or outdoor applications, the element of corrosion exists in varying degrees. Additional factors of abrasive wear, impact and fatigue also play a part in service life.

Because high-strength steel has substantially greater resistance to abrasion than mild steel and provides more effective corrosion resistance, it is proving particularly economical in chain-conveyor pans for underground and surface use. In the mine-car field, one of the largest deep operations in the country began installing 1,000 new mine cars recently. All these latest-model cars, incorporating design improvements accumulated during years of experience, have bodies made of high-strength steel. The major purposes in using high-strength steel were: (1) superior resistance to corrosion and abrasion and (2) greater strength. Any weight saving is of minor importance with these new cars.

Quarry-type and coal-haulage truck bodies are built to withstand the most severe operating conditions a dump truck encounters. When it is being loaded, the truck body is subjected to major impact stresses as rocks and gravel are dropped into the bed and smash against side plates, front plates and the rear slope plate. During transport and in dumping, the body is subjected to severe abrasion and fatigue. The continual wetting and drying of the body sections, usual in mining operations, plus other factors, cause corrosion. The ability of high-strength steels to provide long service life in meeting the requirements for this job makes it one of the most naturally economical and efficient uses for high-strength steels yet developed.

Advantages in Shovel Design

Similar all-around advantages in the use of high-strength steel are illustrated in the manufacture of power shovels and cranes. For example, one manufacturer has incorporated the following in the design of a popular small shovel:

1. Crane cab stock has been reduced two gages through the use of Otiscoloy high-strength steel to replace mild-steel sheets. A secondary advantage is greater resistance to corrosion.

2. The back plate and two side plates of the bucket have been reduced in thickness without any sacrifice in strength. The reduction in plate size decreases weight of the bucket, thereby increasing the service life of the working parts which operate it. The buckets also have better resistance to abrasion and corrosion.

3. Because of its greater strength and fatigue resistance, the high-strength boom will support a larger bucket, whereas a mild-steel boom of equivalent weight would support only a ½-yd bucket.

In long-distance transportation, raw materials such as coal and iron are carried primarily by rail and by water. The trend toward increased use of high-strength steels in both of these fields is now under way on a large scale.

In hopper cars and gondolas, the use of high-strength steel has been notably successful, not only in reducing dead weight by as much as 5½ tons per car, but in prolonging service life. Maintenance and replacement costs have been reduced because of the added corrosion and abrasion resistance. Similar experience has been reported in barges, where abrasive wear from loading and unloading, impact from clamshell buckets and corrosive conditions all call for high-strength steel liner plates.

On a larger scale these same conditions are encountered in coastal and Great Lakes freighters, particularly in those engaged in the transportation of coal and iron ore. Cargo-hold plates are eaten by corrosion and worn abrasively during loading and unloading. In addition they are subject to the beating of clamshell buckets which occasionally drop hard enough to tear gaping holes in the mild-steel plates of a cargo-hold bottom. Close observation of the wear on high-strength steel plates now in service shows remarkable performance. This indication is borne out in actual records of reduced maintenance and repair, wherein greater tonnage is handled per season as a result of practically no time out for high-cost repairs.

Cargo Holds Last Longer

In the cargo-hold floor, or "tank top," as it is known, mild-steel plates become "ribbed" from wear as unsupported sections begin to sag. Ribbing results from the simultaneous weakening of the plates by corrosion and abrasion and from the pounding they receive during loading and unloading.

As the plates become more ribbed, the difficulties in unloading increase. The hold cannot be cleaned as thoroughly either by Hueletts or clamshells, and manual cleaning methods must be employed. This means more time and greater cost in unloading. It also means less time during which the ship is carrying cargo. In the event a plate is punctured during unloading, it must be repaired before it can be loaded again. This means more down time.

High-strength steel is proving its superiority as cargo-hold plate, not only in withstanding corrosive and abrasive wear, but also because of greater strength which has considerably reduced both ribbing and puncturing. The result is substantial savings in operations.

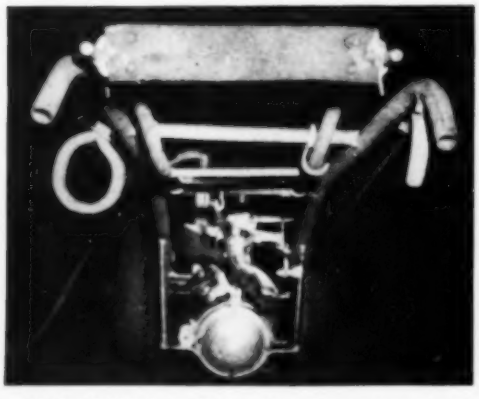
High-strength steel was originally developed to effect greater savings by eliminating dead weight. To do this job additional qualities were developed which today are overshadowing weight-saving in many cases by providing greater strength and longer service life under severe operating conditions. This trend, which began almost as a by-product in the use of high-strength steels, is now becoming a more important and significant role in the design and manufacture of modern industrial equipment.

NEW ONE-MAN RUBBER-TIRED UNIT drills a 2-in 8½-ft hole in 75 sec. The company-designed rig has permitted a 50% saving in labor cost, while at the same time effecting better shooting and safer and easier drilling than with former two man crews.

One-Man Bottom Drill

Company-Built Rubber-Tired-Mounted Electric Drill Cuts Labor Cost in Half at Consolidation Coal Co. (W. Va.) — Cleaner Bottom and Safer Operation With Less Physical Effort Features of the One-Man Unit

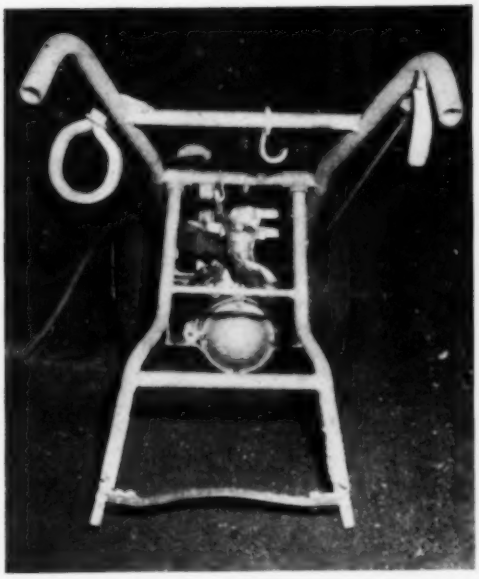
LABOR COST of drilling has been cut 50%, a cleaner bottom secured and greater safety assured with a new one-man drilling unit developed at Mine No. 25, Consolidation Coal Co. (W. Va.), Clarksburg, W. Va. The new rig, consisting of an electric drill mounted on a rub-



WITH THE FRAME in the "up" position, the operator pushes his body against the belting to force the auger to take hold.

LONNIE W. VINCENT (left), section foreman, and L. F. Wilson, superintendent, one of the developers of the drill rig.

A PEDESTAL (right) equipped with a clamp holds the auger when the machine is moved to another working place.



WHEN THE FRAME and push band are dropped to the floor, the operator can brace the drill with his foot.

ber-tired truck, is operated and transported by one man, who can drill at least 30 places per shift with it if desired. Normal operation requires drilling of 17 places per shift.

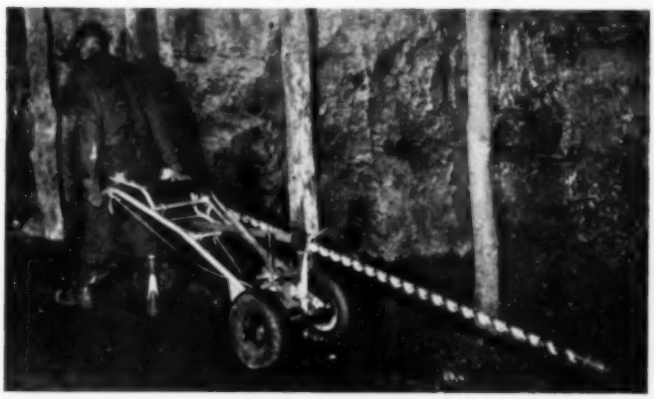
In recognition of their work in the development and building of the machine, Consol awarded $100 checks to L. F. Wilson, superintendent, and Darl Robinson and Chester Conrad. The first of the two units now used regularly in the mine went into service in October, 1947. Application has been made for patents covering the machine.

The new unit consists of a Jeffrey A-7 drill underslung on a lightweight two-wheeled truck equipped with plow handles, one of which has a "deadman" grip control of the motor switch. A hinged frame and band between the handles can be used by the operator in the "up" position to push the drill forward with his body or, when dropped to the floor, to force or brace the machine with his foot. In the "down" position, the frame also prevents the machine from tipping back when not in use. A rack and clamp on the side of the unit provide a place for carrying the auger when the unit is moved.

At Mine No. 25, 7½ ft of the 8½-ft Pittsburgh seam is taken, using mobile loaders and shuttle cars. Top cutting is the practice, so as not to disturb the roof. In development, working places are 14 ft wide and usually are shot with three holes, while in the blocks rooms are 20 ft wide and four holes are drilled. The new unit can drill a 2-in hole 8½-ft deep in 75 sec, and the one operator does not have to work as hard as either of the two men who formerly comprised a drill crew.

With the hand-held drill formerly in use, the drill crew started the holes 12 to 14 in above the bottom and angled them downward, but this usually resulted in some bottom coal being left in place. With the new mounted unit, the auger is started so low that shooting leaves a clean bottom.

Safety is another advantage of the mounted drill, because no one can be near the auger while it is in motion. Workmen in the mine have dubbed the machine "the grasshopper drill."



THE NEW "GRASSHOPPER DRILL," as it is called by the miners, is easily moved from place to place by one man to drill up to 30 places per shift.

BLENDING STATION has six car unloaders, elevated platform providing bird's-eye view, central switch panel and 356-ft belt that conveys the blended coal to the elevated reloading boom.

Plant Blends Two Coals

Outdoor Blending Plant Mixes High- and Low-Ash Coals in Desired Proportions for Shipping—Central Control Panel Located for View of Whole Operation—Walkway Alongside Belt Provides Access for Maintenance

TANDEM-DRIVE PULLEY, built in DeBardeleben central shop, prevents belt slippage even in wet weather.

MARY LEE COAL, washed at the Hull plant a mile away, and low-ash coal from the Black Creek seam, prepared at the Empire washer some 7 miles distant, are mixed for specific markets at the new Lorton blending plant recently completed by the DeBardeleben Coal Corp., Sipsey, Ala. Capacity of the new plant is 900 tons per day of nut and 1½x0 sizes.

The Lorton plant, shown in the accompanying illustrations, consists essentially of a treated-timber open-air structure some 375 ft long; six No. 92 Barber-Greene unloaders permanently installed in pairs on 50-ft centers at the east end of the structure and driven by five 220-volt 5-hp Crocker-Wheeler motors and one 220-volt 5-hp General Electric motor; and a rubber belt conveyor that carries coal 356 ft from the eastern-most unloader to the elevated reloading boom at the west end of the structure. The plant parallels a sidetrack turned off a spur line of the Frisco Ry., which serves the Hull and Empire cleaning plants.

Washed and sized coal is hauled from the two preparation plants to the Lorton blending station in rail-

BELT LIFTS blended coal up incline and delivers it to reloading boom. Walkway provides access for belt maintenance.

CENTRAL SWITCH PANEL is located to give Troy Sullivan, foreman, view of entire blending operation.

road hopper cars, which are spotted over the Barber-Greene unloaders at the blending station. The unloaders deliver coal from the cars onto the blending-plant belt in the proportions desired. The belt conveyor carries the blended coal up an incline and delivers it into the elevated reloading boom, which discharges into railroad cars spotted at the west end of the plant.

The entire blending operation is controlled from an overhead platform at the east end of the plant. From this platform, which is equipped with a push-button switch panel, the operator is able to watch the operation and control the starting and stopping of the whole plant or any part of it. Besides the switch panel on the operator's platform, pushbutton starters are provided at six stations alongside the belt for stopping the entire plant in an emergency. A walkway paralleling the belt provides easy access for lubricating belt idlers and performing other maintenance jobs.

Electrical controls are Trumbull Type D entrance switches and Trumbull Type CM-7½ magnetic starters. Switches and starters are housed in a steel-wire cage on the operator's platform near the control panel. The cage can be locked to prevent tampering by vandals and a roof provides partial protection from weather. Three Phister fire extinguishers are kept inside the switch cage. The over-all push-button control panel is located at the operator's station, from which he has a bird's-eye view of all six unloaders, the entire length of the belt and whatever cars may be spotted for unloading. A rubber flap protects the control panel from weather.

The belt is a 30-in Hewitt carried on Robins-Myers rollers. Tandem-drive double-grip pulleys built in the DeBardeleben main shop at Sipsey assure minimum slippage even in wet weather. The belt is driven by a 25-hp 220-volt Crocker-Wheeler motor with a Joy speed reducer. Power for the plant is tapped from a nearby highline.

A small office, equipped with desk, telephone and stove, has been built close by for Troy Sullivan, foreman of the Lorton blending plant.

A. L. SULLIVAN (left), superintendent, Hull preparation plant, is shown around the Lorton blending plant by his brother Troy, foreman.

Mountainside Contours Set the Pattern for a Tennessee Strip Mine

WALKING DRAGLINE, stopped here for cable repairs, casts overburden down mountainside for a cut varying up to about 60 ft wide.

HIGHWALL DRILL, when spotted, is held in place by lowering pointed screw pins at corners, which also take load off drill wheels.

ROAD PATROL scrapes off "middleman" and pushes it over the mountainside or into sinkings left by old deep workings.

LOADING SHOVEL makes one pass or more, depending on width of cut. Sinking from old deep mine can be seen beyond shovel cab.

HYDRAULIC REAR-DUMP TRUCKS climb ramp in valley and unload into tipple hopper. Steel gates channel coal into the hopper below and prevent spillage on runway.

TIPPLE BAR SCREEN separates domestic block size and minus 4-in for steam.

MOUNTAINSIDE STRIPPING removes up to 60 ft of overburden for two-stage loading of 60-in seam divided by a "middleman." Cutting along main contour lines reduces pit haulage-road curves to a minimum.

Folk Contour Stripping

Dragline Cuts Along Main Contour Lines and Casts Down Mountainside—"Middleman" in 60-in Seam Requires Two-Stage Loading — Dozer and Road Patrol Scrape Off Parting—Road Grade Favors Loads

CONTOUR STRIPPING is practiced by the H. E. Folk Mining Co. to produce 650 tons per day of steam and domestic coal from a block of Mason seam lying near the top of a mountain close to Valley Creek, Tenn. Overburden up to 60 ft is removed to uncover the coal, which averages 60 in in thickness and is divided about midway by a "middleman" of soft blue shale which ranges up to 6 in in thickness and sometimes disappears altogether.

From time to time, the stripping operation, which works inward from the outcrop near the crest of the mountain, breaks into old deep-mine entries and rooms which were worked many years ago and which now interrupt the loading continuity for short periods. Maps of the old workings are not reliable, but care in handling the stripping and loading equipment avoids any damage to pit machinery and trucks and the cleanliness and high quality of the coal make the operation economically sound in spite of short interruptions due to encounters with the old rooms and entries.

A cross-section of the overburden averages 2 to 4 ft of blue slate above the coal followed by 8 to 20 ft of sandstone, the remainder being sandclay and topsoil spotted with a good many heavy boulders. To prepare the overburden for stripping, horizontal holes 60 ft deep and 6 in in diameter are drilled on 12-ft centers 1½ to 2 ft above the coal. Drilling is done by two McCarthy drills driven by Wisconsin Model VP-4 aircooled gasoline engines. The drills are fixed in position for work by lowering four pointed screw jacks which, when lowered, take the load off the drill's wheels and thus hold it in place close to the highwall. Shooting material usually is 40% dynamite, but Nitramon sometimes is used.

In addition to shooting overburden, the pit workers also must break up the heavy boulders lying on the surface and just beneath to enable the stripping dragline to handle them. These boulders are drilled with air jackhammers, air being provided by a Gardner-Denver compressor with a gasoline engine. This compressor doubles in brass to provide air pressure for lubricating dozers and other pit equipment at the stripping scene.

A Page walking dragline, diesel-powered, with a 5-yd Esco bucket casts spoil down the mountainside as it advances. The boom is 115 ft long and usually operates at 30 to 45 deg off the horizontal. Depth of the overburden, of course, ranges from practically zero up to a stripping limit of 60 ft, depending upon the contour of the ridges and depressions on the mountainside. Likewise, the width of the cut varies from a few feet up to about 60, since it is hardly practicable to follow every minor curve in the outcrop line and since the overburden limit is encountered at various distances into the side of the mountain. On the whole, the stripping pattern follows only the major contour lines, thus reducing haulage-road curves to a minimum.

After the dragline has cleared off the overburden and cast it down the mountainside, thus exposing the coal, two Caterpillar D-8 diesel tractors equipped with LeTourneau blades, together with one of a pair of Caterpillar road patrols owned by the company, clean off the coal prior to loading out the top half of the seam.

Loading is done in two stages by a North-West 78-D shovel with a 3-yd Amsco dipper and a Murphy diesel engine. The top half, largely steam coal down to the "middle-

FOLK OPERATING OFFICIALS—J. M. Bowen (left), office manager and engineer; Wilson Crow, superintendent; P. B. Rumer, pit foreman; Kelly Davis, tipple foreman and Tom Tribble, shop foreman.

man," is loaded out, sometimes in one pass and sometimes in two or three passes, depending on the width of the cut. After the top half is loaded, the dozers and the road patrol move in again and scrape off the "middleman," pushing it either down the side of the mountain or into depressions formed by caving of the old deep-mine workings.

When the cut is so wide that the loading shovel must make two or more passes, the dozers and the road patrol first clean a lengthwise strip wide enough for the shovel's first pass and then, while the shovel loads the cleaned-off coal, move over and scrape the "middleman" off the top of the remainder, thus clearing the way for a second or third pass by the shovel. Thus, when the cut is wide enough to require two or three passes by the shovel, scraping and loading operations go on without interruption. However, when the cut is wide enough for only one pass by the shovel, it must stand idle while the coal is being cleaned off.

The lower half of the seam comprises about 50% block coal suitable for domestic use. Being loaded out after the "middleman" is removed, it exposes a firm bottom which makes a good foundation for pit haulage roads. Here and there the coal has been slightly "stained" adjacent to old rooms and entries. "Stained" coal is simply left in place or, if it blocks the pit haulage road, is dumped over the mountainside.

Haulage equipment at the Folk operation includes the following: four KB-11 International tractors with 15-ton Hercules semi-trailers; four International tractors bought from the War Assets Administration for pulling 12-ton Penn semi-trailers; and one Federal diesel tractor with a 15-ton Penn semi-trailer. All tractors except the Federal are gasoline powered. The semi-trailers are hydraulic end-dump.

Haulage roads in the pit area, as indicated earlier, are built on the firm slate bottom after the coal is loaded out. Roads are 40 ft wide with a crushed limestone topping. Since the coal seam lies practically level, there is little or no grade in the pit. Water leaking from the mountain and from the old deep workings onto the roads and into the pit is drained off by gravity.

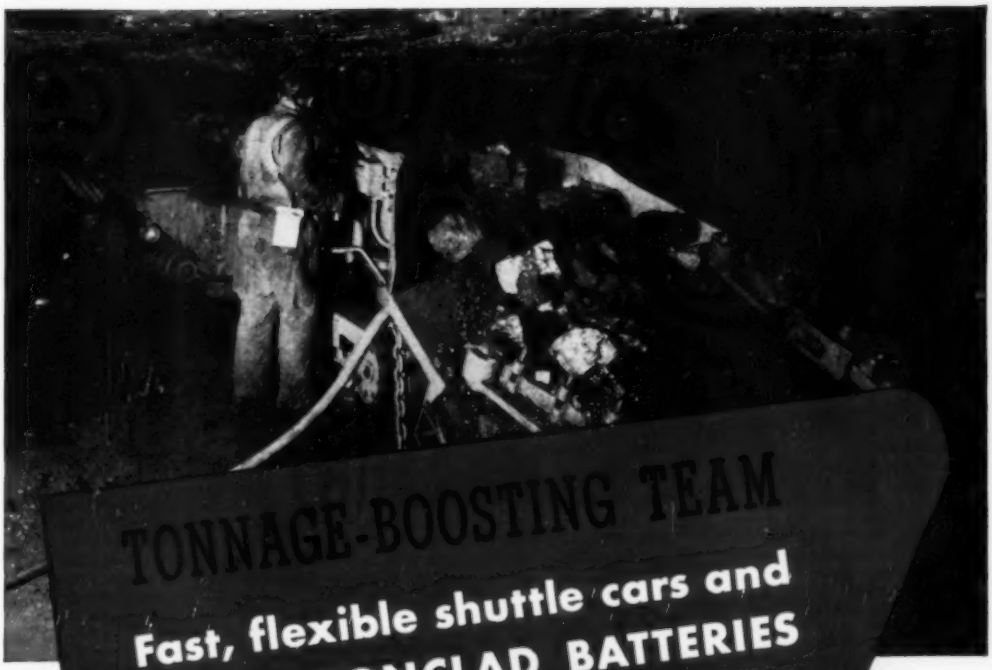
A two-mile haulage road from the start of the stripping near the top of the mountain to the tipple in the valley below was especially engineered and built for the heavy trucks. This road also is 40 ft wide with a 2-in layer crushed limestone that packs well into the natural sandclay soil and makes a satisfactory surface. The grade on this road averages 10% favoring the load and the descent to the valley is accomplished by two sharp switchbacks. The steep grade makes brake maintenance a real problem for shop mechanics, who do their repair and maintenance work in two buildings near the tipple. In wet weather, there is some danger of landslides along the main haulage road and in the pit area, but a careful lookout is maintained against this danger and one of the two road patrols, plus a dozer, is always on call to make needed repairs.

Loaded trucks reaching the valley after negotiating the grade and curves haul the coal up a ramp at the tipple and dump from the rear into a hopper. At the dumping point, hinged gates of sheet steel are lifted manually after the truck is spotted and thus channel the coal into the hopper below, preventing spillage on the runway.

A motor-driven rubber conveyor belt lifts the coal from the hopper up through a gallery, where one man is stationed to handpick the small amount of slate that may have been loaded at the pit, and unloads it onto a 4-in bar screen. From this point the coal, being separated into plus 4-in blocks and minus 4-in run-of-mine, rolls by gravity down steel-lined chutes into waiting railroad cars. Being clean as mined, the product is readily marketable for domestic and steam purposes without being washed. The coal averages 2% inherent ash and about 14,500 Btu per pound.

The H. E. Folk Mining Co. is an operating subsidiary of H. N. Rogers & Sons, Memphis, Tenn. Operating officials at the Valley Creek mine are: Wilson Crow, superintendent; J. M. Bowen, office manager and engineer; P. B. Rumer, pit foreman; James A. Garrison, heavy equipment foreman; Tom Tribble, shop foreman; and Kelly Davis, tipple foreman.

In conjunction with the Folk stripping operation, the Pruden Coal Co., with offices in nearby Pruden, Tenn., cuts mine timbers off the mountainside ahead of the dragline. A crawler-mounted Caterpillar D-8 diesel with an angle dozer blade is assigned by the Pruden Coal Co. to cut a timber-haulage road ahead of the dragline and close to the outcrop. Pruden timbermen follow, cutting posts to the proper length for use in their company's deep mine some three miles distant. Timbers are stacked alongside the temporary road and are hauled out before the dragline moves in.



Production moves swiftly, smoothly, *safely ...and you can count on full shift availability* ...when your battery-powered haulage units are equipped with Exide-Ironclad Batteries.

Exide-Ironclad Batteries are different from all others. They have all four of the characteristics that a storage battery must have to assure maximum performance from mine locomotives, trammers and shuttle cars—high power ability, high electrical efficiency, ruggedness and a long life with minimum maintenance. The combination of these four Exide-Ironclad characteristics assures years of day-in, day-out service with dependability and economy.

1888 . . . *Dependable Batteries for 61 Years* . . . 1949

SAFE DEPENDABLE POWER

"Exide-Ironclad" *Reg. Trade-mark U. S. Pat. Off.*

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • *Exide Batteries of Canada, Limited, Toronto*

The Foremen's Forum

Improved Maintenance Leads To High Efficiency and Low Cost

EVERY FOREMAN who wants to get ahead in coal mining aims for high efficiency and low cost in his mine or section. In other words, he tries to get the best performance from men and machines.

One of the surest ways to get the best from men is to provide them with machines that work fast, respond quickly to controls and keep on cutting, drilling, loading or hauling with the least possible interruption. However, when a key machine breaks down—a loading machine, for example—you don't get anything from your men. The company pays them while they stand by. Meanwhile, fans, pumps and motor-generators keep on going, locomotives and mine cars or belts are idle and the preparation plant slows down or stops altogether. All that adds up to low efficiency and high cost, which is just what you don't want.

Thus, good maintenance that keeps machines working smoothly without interruption is essential if your company is to stay in business and keep on making a fair profit.

How is good maintenance obtained? Here are some simple suggestions:

1. Systematize inspections. If you are the boss of a big mine, it may be smart to set up a team of inspectors—probably one electrician and one mechanic—who will give their full time to inspecting, reporting defects and recommending repairs or alterations. The inspection team should be given a schedule that guarantees inspection of all equipment items at regular intervals—cutting machines, drills, locomotives, loading machines, driving motors, belts, mine cars, cables, switchboxes, wash boxes, screens and hoisting ropes, to mention only a few.

If your mine is a small one, try making each machine operator, motorman, driller or rockduster responsible for reporting the first signs of trouble. Most of your men will go along with you if you tell them what you want to know and why you need to know it.

Either way—with a full-time inspection team or with your own machine operators on the lookout—small adjustments, replacements and repairs will be taken care of before they break out as major troubles and cause a long and costly shutdown.

Always be on the lookout yourself for worn cables, jagged edges on mine cars, poor couplings, loose seals, hot bearings and other things which, if not corrected, can cause big trouble later. Likewise, keep alert for possible changes in machine design—to be made locally or with the help of manufacturers' engineers—that will reduce wear, lengthen machine life, reduce tramming time, increase safety, boost cutting, drilling, loading or hauling speed or make parts more accessible for inspection, repair, replacement or lubrication.

2. Standardize inspection and maintenance reports. You can't always depend on memory, yours or anybody else's, but a written report is a permanent record. Besides reminding you that certain jobs ought to be done, written reports over a period of time point up the weak spots in your inspection and maintenance schedules, make it easier to follow through on repairs and, if something goes badly wrong, help fix the responsibility.

Whether your mine has an inspection team or not, you ought to make written reports yourself. Build them around what your men tell you and on what you observe in your rounds through the mine or section. As stated earlier, it's easy to forget if you trust to your memory but a written record keeps you reminded of the things that need to be done.

Every report ought to include (1) the date and time of the inspection, (2) identification of the machine or item of equipment inspected, (3) a statement of what parts of the equipment or machine the inspector examined, (4) a statement of what repairs or adjustments were made on the spot, (5) the inspector's recommendation if major work is needed and (6) the inspector's name. In addition, the report ought to provide for follow-through when major repairs are needed, per the next paragraph.

3. Follow through promptly on inspection and maintenance reports. The hour you lose today for minor adjustments may save you a whole day's work tomorrow. Every inspection and maintenance report ought to include, in addition to the information called for in the paragraph just above, the following: (7) space for you to write a work order, if the report shows that a repair job is needed, (8) space for the shop foreman or other responsible person to certify that the work order has been carried out and (9) the date and time when the equipment was ready to return to the job.

After you have studied the inspec-

How Are You on Human Relations?

Good wages do a lot to keep men contented with their jobs and regular at their work. But wages aren't the whole story. To get the best out of his men, to get them to give the plus effort that spells the difference between ordinary and excellent achievement, a foreman has to use all the human-relations skill he can muster.

To see how you measure up in handling your men, check either "Yes" or "No" after each of the 10 questions below. Then turn to p. 108 for the explanation.

1.	Do you size up each man and give him the job he can do best?	Yes ☐	No ☐
2.	Do you give your men full credit when they earn it?	Yes ☐	No ☐
3.	Do you keep your men posted on where they stand?	Yes ☐	No ☐
4.	Do you show confidence in the ability of your men to do a good job?	Yes ☐	No ☐
5.	Do you build up your workers' pride in doing a job well?	Yes ☐	No ☐
6.	Do you keep your crew competing with other crews?	Yes ☐	No ☐
7.	Do you distribute the dirty jobs equally among your men?	Yes ☐	No ☐
8.	Do you try to find out why a man made a mistake before you correct him or discipline him?	Yes ☐	No ☐
9.	Do you act promptly on complaints?	Yes ☐	No ☐
10.	Do you promise only the things you can make good on?	Yes ☐	No ☐

MINE LUBRICANTS

MARATHON

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How to get 6 hours' engine work with only 4 hours' engine wear

CHANGE TO MARATHON V.E.P. OIL. MAKE ENGINES LAST 50% LONGER THAN THEY WOULD WITH ORDINARY OIL*

*Not just a claim. Scientific tests prove it. 12 years of on-the-job experience in gasoline and Diesel engines confirm it: V.E.P. actually makes engines last 50% longer than they would with ordinary oil, do 50% more work between overhauls. Sound like a good way to cut operating costs? Write or wire. Let our mine lubrication engineer *show* you.

Different. Patented. Marathon V.E.P. is the pioneer, heavy-duty oil with these wear-saving extras:

- **TRIPLE-PLUS FILM STRENGTH** gives more than 3 times as much protection as ordinary oil against heat, pressure, shock.
- **CONSTANT CLEANING ACTION** keeps valves and rings free, oil holes and lines open. (Saves fuel, conserves power.)
- **"MAGNETIC – LIKE" FILM** prevents damaging "dry" starts. Stays put at high temperatures. Protects bearings against corrosion.

MARATHON

BEST IN THE LONG RUN

A COMPLETE LINE OF MARATHON LUBRICANTS FOR EVERY OPERATION IN YOUR MINE

THE OHIO OIL COMPANY

Producers of Petroleum since 1887

GENERAL OFFICES: FINDLAY, OHIO • DISTRICT OFFICES: ROBINSON, ILL., INDIANAPOLIS, IND.

Human Relations

All 10 questions on p. 106 should be answered "Yes." Here are the reasons why:

1. Most men really want to do a good job but not all men are fitted to do the same kind of work. When you put a man on the job he can do best, you give him a chance to fulfill his basic desire to work well. If he has a knack for running machinery, put him on a loader or a cutter, not at shoveling rock. If he likes to use his muscles, put him to timbering or laying track, not running a locomotive. If he works best with others, put him in a crew, not at a lonely belt-transfer station. So, study your men carefully and individually and then, when you have found out what makes each one tick, steer him toward the kind of work he can excel in.

2. Everybody likes to be patted on the back when he does something unusually good. So, when a man does well in his job or when your crew sets a new tonnage record, say a good word about them. Be careful not to take a worker's suggestion and claim it as your own. If a man has a good idea, let him know you think it's good and then tell your superior where the idea came from. That way, you'll be known as a square shooter.

3. Everybody likes to feel secure in his job. If you keep a good man guessing about where he stands, he may lose his self-confidence or develop a "don't-care" attitude. On the other hand, it's only fair to tell a man if he's not measuring up to standard. So, wise up the man who is falling short and thus give him a chance to pull himself together. Tell him how he can improve his work. Likewise, keep your good men up to date on their standing.

4. The best boost you can give a man is to show him your faith in his ability. First of all, it shows him that he has earned your trust. In the second place, it challenges him to deserve your further confidence. Telling him he's a good worker gives him a reputation to live up to.

5. However small and unimportant a job a man may be doing, he should have reason to be proud of it. That's up to you, his foreman. Show him how his job fits into the whole operation and what would happen if he failed to do it right or if he didn't show up for work. If he's only a clean-up man in the tipple or the yard, make him want to be the best clean-up man in the business.

6. Most men like to compete with others—and win. Also, they like to beat their own records. Keep your crew informed about what other crews are doing. Challenge your men not to be "also-rans." And every time a man makes a new record or your crew does something special, set a new goal for them.

7. In handing out jobs, play fair and square. Don't pick on a man you don't like or want to punish. When a wet job has to be done, don't send the same man you sent last time. Give each man his fair share of the good and bad jobs. That way, they'll trust you because they are sure of getting a fair shake all the time.

8. Understanding why a man made a mistake ought to precede any correction or discipline you hand out. The chances are, he didn't make his mistake because he wanted to get in trouble. Maybe he didn't understand your instructions or maybe he was worried or sick. If he didn't understand, this is your chance to show him the right way and make him a better worker. If he was worried or sick, he probably shouldn't have come to work. If you listen to his story before you bawl him out, you may save yourself a lot of trouble and keep him from bearing a grudge.

9. Prompt action on complaints shows your men that you're a man who gets things done and thus sets a good example for them. If you let things ride, you'll lose the confidence of your men and end up with a pocketful of serious grievances. If you can't correct the cause of the complaint yourself, pass it on to the man who can and stick with him until he does something or shows you why he can't.

10. It's much better to make no promise at all than to promise something you can't make good on or don't intend to carry out. Whenever you are tempted to get out on this limb, check up with yourself or your superior to see how far your authority goes. Give your men cause to believe that you're a man of your word and that a promise from you means action.

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tion report and are satisfied that the called-for jobs have been done, the report should go into the permanent files in the superintendent's office.

4. Get the most out of the skills of your men. That is, don't send a boy to do a man's job. In the long run, that's a waste of valuable time. Likewise, it's a waste of time and money to send skilled men to do an ordinary run-of-the-mine job. For example, don't send two electricians to do a job that an electrician and an unskilled helper can do.

5. Avoid doing routine work yourself. Resist the temptation to try your hand at a job you used to do before you became a foreman. The company made you a foreman because you showed talents and skills above the ordinary. Your responsibilities now are wider and bigger than routine work. So don't waste your company's money by taking time to do a job that lower-paid workers can do.

Following these suggestions will be a long step in the direction of high efficiency and low cost in your mine or section. Planned maintenance, geared to regular inspection and standard reports is the key. The dollar you spend today may save you $100 tomorrow by preventing an unplanned and costly breakdown.

•

Shuttle-Car Safety Hints

Shortly after a changeover to shuttle cars in some mines of the Red Jacket Coal Corp., *The Red Jacketeer*, company magazine, published the following suggestions for safe "buggy" operation. The suggestions, the magazine said, are based on accident experience at other mines.

"1. Shuttle car should be examined daily with particular attention to the steering mechanism, brakes, tires, lights and gong. The shuttle car should be in safe operating condition at all times.

"2. No one but the operator should ride the shuttle car. The operator should not 'show off' and he should realize that the machine he is handling could cause an accident if not handled properly.

"3. The gong should be sounded whenever the shuttle car is approaching a curve, a door, a curtain where men are working and any other place where vision is limited. The use of translucert curtains is advantageous in that it enables persons to see the approaching shuttle car. The operator can also see the individual's light.

"4. The operator should always face the direction of travel except when the shuttle car is being loaded. If shuttle cars are traveling in the same direction, they should not travel any closer than 25 ft to each other in normal operation.

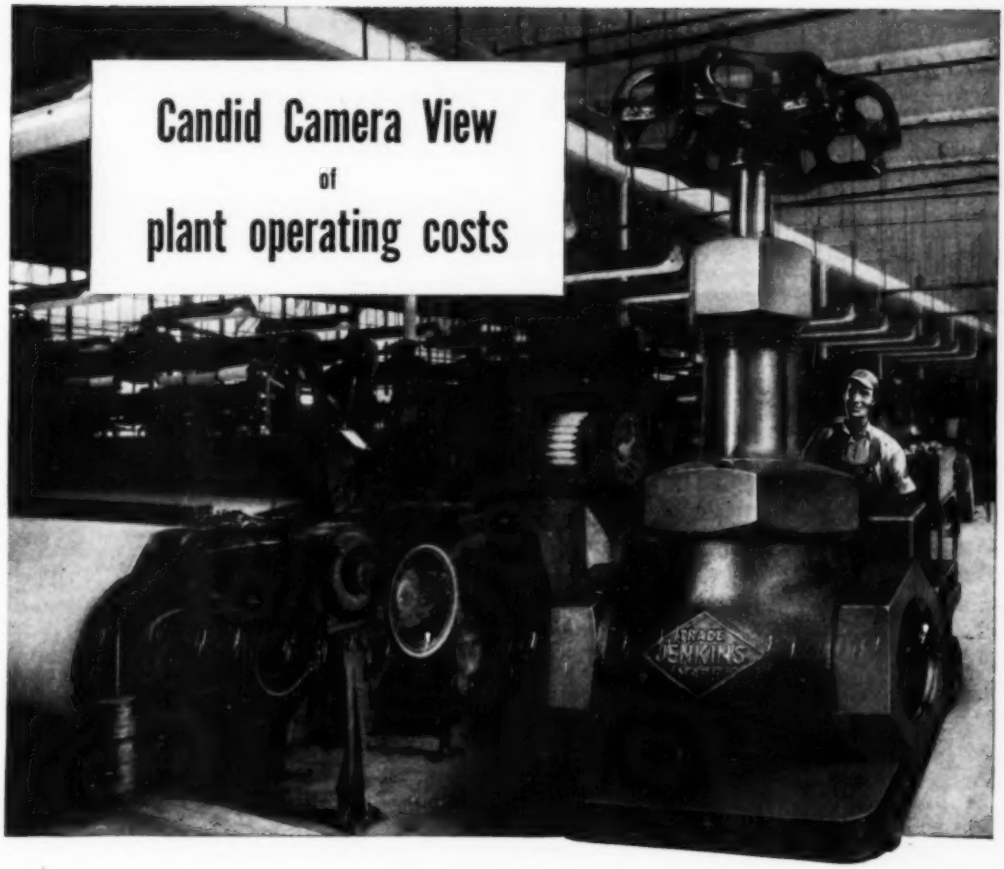
"5. 'Horseplay' in or around shuttle cars or along the runways has been the cause of a number of accidents.

"6. Shuttle cars running over cables may cause injuries and possibly mine fires. Each time a shuttle car runs over a cable, it tends to roll the wires over each other and eventually a short circuit occurs, blowing out the insulation. Cables should be either suspended overhead or trenched into the floor. Each shuttle car should be equipped with at least one suitable fire extinguisher.

"7. Short shuttle-car travel is more efficient from a safety and production standpoint. The runways stay in better condition and less dust is likely to accumulate.

"8. Special consideration should be given to the timbering at turns. The preferable method, from both a safety and efficiency standpoint, is to use some method which does not require the use of posts to support the crossbars.

"The same precautions should be followed by all employees in and around shuttle cars as are followed in automobile traffic on the surface. Consider all of the above suggestions and then BE CAREFUL because SAFETY IS NO ACCIDENT!"



FOCUSED on operating costs of a textile plant, a truly candid camera would record this view of valves in proper relation, cost-wise, to other equipment. By the simple photo-magic of showing *all* valves in the plant as *one* valve, the picture points up an important fact—that valves, collectively, are a major investment in *any* plant, *any* large building where operation involves fluid control.

IT PAYS MANAGEMENT to keep this fact in mind. With wages and material costs the highest ever, valve maintenance costs must be watched as carefully as operating expense of larger plant units.

EXCESSIVE MAINTENANCE of one inferior valve is insignificant, but multiplied by thousands, it is a serious drain on operating budgets.

JENKINS BROS. helps you meet this problem two ways. First, by building extra endurance into Jenkins Valves, making them the longest-lasting, lowest-upkeep valves that money can buy. Second, with advice from Jenkins Engineers on any question of proper selection, installation, or maintenance.

For all new installations, for all replacements, rely on Jenkins quality and engineering for lowest valve costs in the long run. Sold through leading Industrial Distributors.

Jenkins Bros., 80 White St., New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco; Jenkins Bros., Ltd., Montreal.

"PREVENT VALVE FAILURE" is a 28-page guide to valve economy, fully illustrated, with case histories of valve damage, and recommendations for its prevention by proper selection, installation, inspection, and maintenance. FREE on request. Write JENKINS BROS., 80 White St., New York 13, N. Y.

LOOK FOR THIS JENKINS DIAMOND MARK

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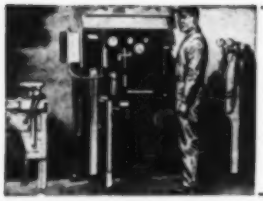
JENKINS VALVES

Types, Sizes, Pressures, Metals for Every Need



Operating Ideas

Versatile Fire Truck Carries Varied Equipment

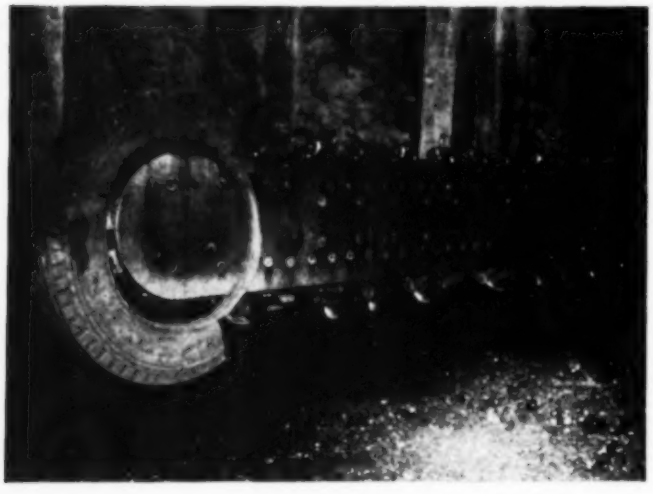
ROCK-DUSTING MACHINE on new Federal No. 1 fire truck being tested in the supply yard. Mounted on a mine-car frame, the unit carries equipment to combat various types of mine fires.

A NEW MINE FIRE TRUCK now in use at Federal No. 1 mine, Coal Division, Eastern Gas & Fuel Associates, Grant Town, W. Va., was especially designed by C. E. Zuspan, master mechanic, to include the special equipment necessary to combat the various types of mine fires that might be encountered at the operation. Mounted on a mine-car frame, the unit is so designed that it can be quickly moved to any location along the tracked haulways.

In addition to six hand-held Dugas fire extinguishers, the truck carries two 50-gal drums of Karbaloy, one of which is connected to a 10-gal drum of carbon dioxide under 300-lb pressure, and a MSA Bantam rock duster equipped with six bags of rock dust. It has a 100-ft 1-in hose that can throw a spray 50 ft.

The portable fire-fighting unit supplements Pyrene and Fyr-Fyter extinguishers carried on all mobile equipment in Federal No. 1 mine, as well as the chemical extinguishers and rock dusters located at all doors, battery-charging stations and substations.

Cutaway Tire Guards End of Cutter-Bar



SAFE TRAMMING of a cutting machine is provided by cutaway tire casing on the end of the cutter-bar and a heavy chain (far right) preventing accidental operation.

SOME 20 TO 25 YEARS AGO, these columns often included articles describing money-saving gadgets made from parts of a Model T. While that day is past, automobiles still contribute, as shown in the accompanying photograph.

This cutaway 6.00x16-in tire casing guards the end of the cutter-bar on a Sullivan 10RU rubber-tired cutting machine while it is being trammed in Mine No. 25, Consolidated Coal Co. (W. Va.), Clarksburg, W. Va. A heavy chain wrapped around and hooked at the rear of the bar prevents accidental operation.

Inter-State Iron Company

SAVES MONEY, INCREASES ORE PRODUCTION

with J&L heat-treated JALLOY Steel

J&L STEEL

Iron ore and rock drop from Jalloy Steel lined truck bodies into Jalloy lined chutes. Jalloy chute plates last an entire 6½-month season compared with 6 weeks service from mild steel plates.

3-year tests prove heat-treated Jalloy plates last 4 to 6 times longer than mild steel under severe abrasion and impact conditions.

Steel men call J&L Jalloy a manganese-molybdenum alloy steel.

But maintenance men for the Inter-State Iron Company on the famed Mesabi Range in Minnesota, call it "*that hard stuff.*"

Why? Because they've worked with it for 3 years on some of the toughest applications from the standpoint of abrasion and impact to which steel has ever been subjected.

They've seen J&L heat-treated Jalloy plates—in ore chutes, truck bottoms, bang-boards, baffle plates and in other similar applications—*last 4 to 6 times longer than mild steel.*

They've seen the long life of Jalloy *cut the cost of* steel for certain applications *by more than one-half.*

They've seen it *save thousands of man-hours of work*, and *step up production* by thousands of tons of iron ore, by eliminating the down-time required to replace steel that could not "take it" for a full season.

These 3 years of exhaustive field-testing have proved that J&L Jalloy is really "hard stuff"—that it stands up under the most gruelling abrasion and impact conditions—that it saves both time and money.

If abrasion and impact are eating away the steel in your equipment—and eating up your profits by frequent down-time and costly replacements—it will pay you to investigate J&L Jalloy steel.

For full information send for the booklet mentioned in the coupon below.

Jones & Laughlin Steel Corporation
411 Jones & Laughlin Building
Pittsburgh 19, Pennsylvania

Please send me your booklet: "Jalloy—J&L Alloy Steel."

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COMPANY _____

ADDRESS _____

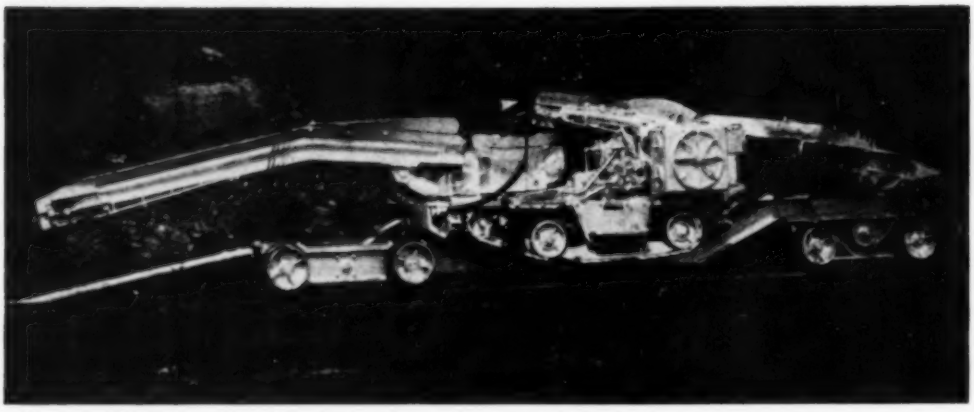
Do you recommend Jalloy for _____

JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L manufactures a full line of carbon steel products, as well as certain products in OTISCOLOY *and* JALLOY *(hi-tensile steels).*

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

Articulated Truck Transports Loading Machines



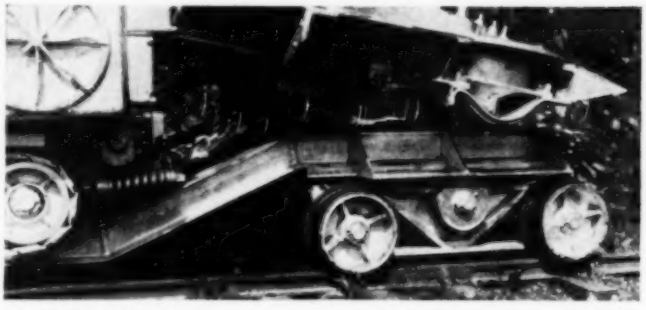
COMPANY BUILT TRANSPORTER holds a loading machine ready to be taken down the 18-deg slope into the mine.

A TRANSPORTER of unusual design for carrying Joy loading machines in the Wildwood mine of the Butler Consolidated Coal Co., Wildwood, Pa., provides for quick and easy loading and unloading of the machine, can be pulled at relatively high speeds without derailment and features a drawbar anchorage that permits carrying a loading machine up or down the 18-deg supply slope.

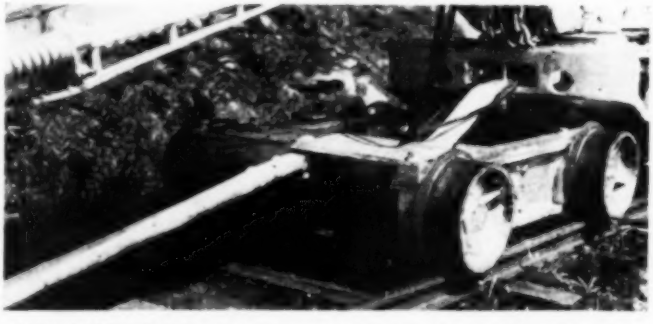
The unit, as shown in the accompanying illustrations, was designed on 8-wheeled pivoted trucks so that it can negotiate short-radius curves, although it has a rather long total wheelbase. To load a machine, the front truck is disconnected from the frame or bed and the latter is dropped down onto the ties to form a ramp for moving the machine up onto the bed. The front end of the bed then is jacked up and connected to the front truck. The tongue, or main drawbar, is of sufficient length that a mine locomotive can be coupled directly to the unit without it being necessary to have a flat car in between.

Both 12BU and 5BU loading machines are carried on the transporter, as well as other heavy equipment. The Thick Freeport seam mined lies fairly level and the main opening of the mine is an 18-deg slope containing a belt conveyor and a materials track. The auxiliary drawbar, designed to hold the machine on the transporter while moving up or down the slope, connects from the loading-machine bumper to the front truck of the articulated unit.

As a result of several years of experience with the transporter, mine officials feel that it represents the ultimate in convenience for the conditions at Wildwood. Since the mine was opened in 1929 and has produced at an average rate of 600,000 to 900,000 tons per year, the distance from slope bottom to working sections is several miles. The main shop, where the transporter was built and loading machines are given complete overhauls, is located on the surface close to the top of the main slope. P. W. Dobson, master mechanic, and J. F. Lase, electrical engineer, were responsible for the design and construction of the unit.



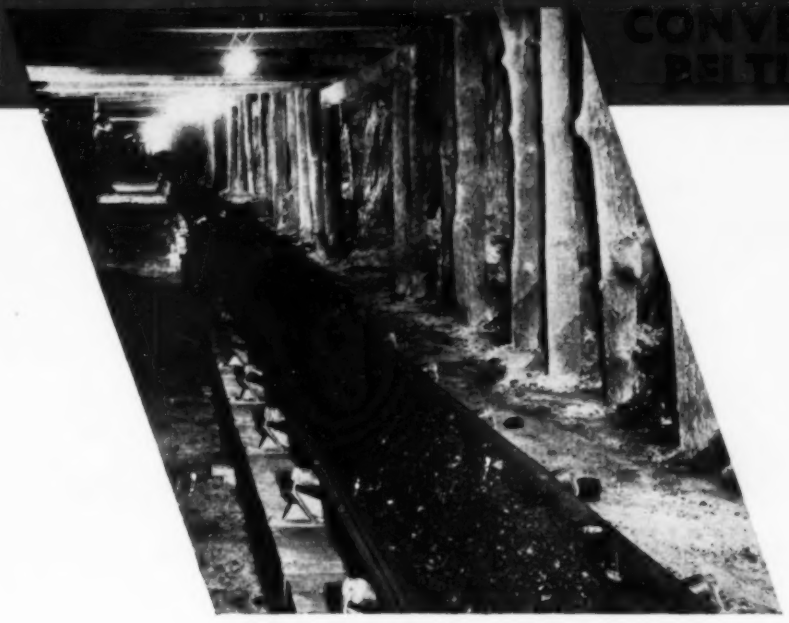
LOADING-MACHINE HEAD rests on the rear truck of the articulated transporter. To load a machine, the front truck is disconnected and the transporter's bed let down to form a ramp.



AUXILIARY DRAWBAR from the loading machine to the front truck of the unit keeps the loader in place going up or down the slope.

FOR FAST, EFFICIENT TRANSPORTATION—SPECIFY

HAMILTON KING KOAL CONVEYOR BELTING



- KING KOAL belts have the ability to meet the varying requirements of entry, gathering, mainline, slope and preparation of plant installations.
- You don't need to worry about mildew or damp rot.
- You can produce to capacity without fear of belt breakage due to severe impacts and heavy loads.
- In short, KING KOAL belts can, and will, give you uninterrupted, maintenance free performance when the going is tough and loss of time is costly.
- Our claims are based on years of proven performance.
- Why not call in a Hamilton sales engineer to discuss your belt problems and requirements.
- Thorough service and prompt delivery are assured.

WE WILL GLADLY SUBMIT
A SAMPLE UPON REQUEST

1870

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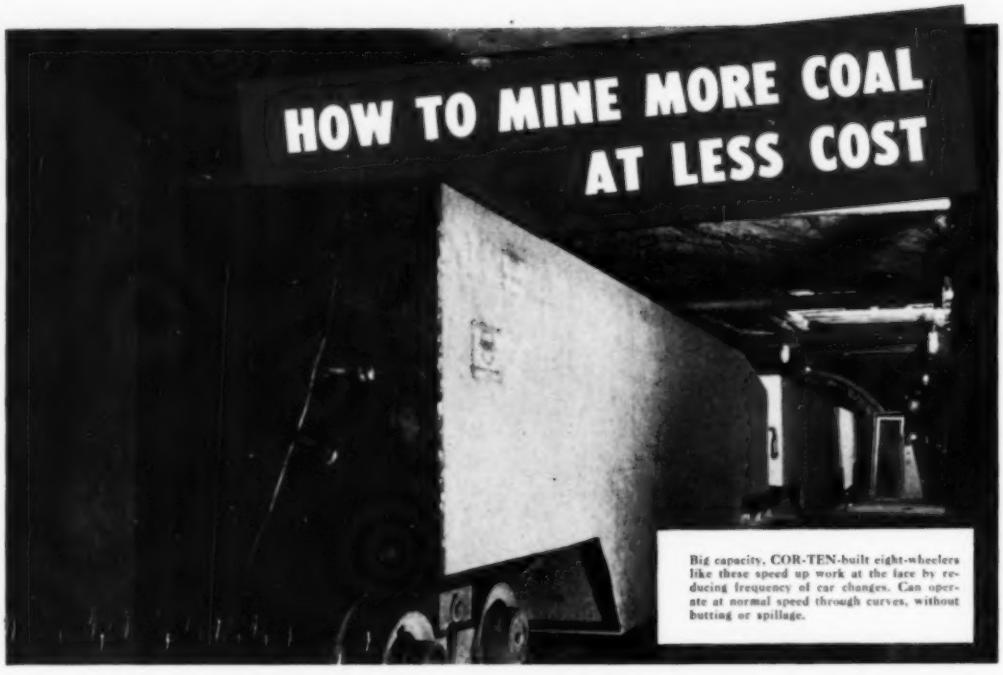
HOW TO MINE MORE COAL AT LESS COST
Big capacity, COR-TEN-built eight-wheelers like these speed up work at the face by reducing frequency of car changes. Can operate at normal speed through curves, without butting or spillage.

Use BIGGER cars . . . built to last longer with **U·S·S COR-TEN**

BIG capacity cars—as big as the physical measurements of your mine allow—will boost your production and reduce your costs because they permit more efficient utilization of loading-machine capacity. It's a proven fact.

It is also a matter of record that if mine cars are properly designed, and built larger and stronger with U·S·S Cor-Ten steel, you can confidently expect *additional* dividends in lower operating costs, in reduced repairs and maintenance, and in greatly increased life.

Why? Because Cor-Ten steel mine car construction is stronger, more resistant to corrosion, to impact, to fatigue, and to abrasion. U·S·S Cor-Ten steel is half again as strong as ordinary carbon steel. Its resistance to atmospheric corrosion is 4 to 6 times greater than plain steel. As a result Cor-Ten cars will absorb abuse and accidental damage that would put cars of other construction right out of service.

Because U·S·S Cor-Ten is strong and stands up so well under wear and tear, cars can be built larger with no loss in strength, will last longer under heavy duty.

To date, more than 20,000 Cor-Ten mine cars have been placed in service. They are operated by 55 of the country's most progressive companies under every sort of condition. What's more, 53% of these cars have been built on repeat orders—after operators had ordered test cars, tried them under their own conditions, and found them to be a great improvement over old-type construction.

For detailed information about U·S·S Cor-Ten steel, write for the "Cor-Ten Book." Simply address a card or letter to Carnegie-Illinois Steel Corporation, 2103 Carnegie Bldg., Pittsburgh 30, Pa.

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U·S·S STAINLESS STEEL

U·S·S COR-TEN · U·S·S MAN-TEN · U·S·S ABRASION RESISTING · U·S·S MANGANESE-NICKEL-COPPER

9-1622

UNITED STATES STEEL

Kennametal Rock Bits Drill 58% Faster

TUNNELING

LOCATION: Marion Co., W. Va.

MATERIAL: Hard Silica, Sandstone

BIT: Kennametal PAD-2 1/4

FOOTAGE PER GRIND: Steel 8', Kennametal 2672'

INCREASE IN DRILLING SPEED: 33%

OVERCAST

LOCATION: Westmoreland Co., Pa.

MATERIAL: Slate, Sandstone

BIT: Kennametal PAF-1 3/8

FOOTAGE PER GRIND: Steel 1.2', Kennametal 508'

INCREASE IN DRILLING SPEED: 42%

BRUSHING

LOCATION: Cambria Co., Pa.

MATERIAL: High Silica, Sandstone

BIT: Kennametal PAF-1 3/8

FOOTAGE PER GRIND: Steel 1.1', Kennametal 198'

INCREASE IN DRILLING SPEED: 75%

GRADING

LOCATION: Cambria Co., Pa.

MATERIAL: Hard Fire Clay

BIT: Kennametal PAH-1 5/8

FOOTAGE PER GRIND: Steel .2', Kennametal 46'

INCREASE IN DRILLING SPEED: 80%

Last 292 Times Longer On These Four Jobs

—and here are other big money-saving, profit-making advantages

- *Greatly Reduced Bit Cost*
- *Less Money For Dynamite*
- *More Footage Drilled Per Shift*
- *Big Reduction In Maintenance Cost*

We'll gladly give you the whole story. Why not get in touch with us today. Mining Division, Kennametal Inc., Latrobe, Pa.

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HELPFUL BOOKLET

KENNAMETAL Inc., Latrobe, Pa.

Please send me a free copy of Booklet on drilling and cutting.

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POSITION_____

COMPANY_____

ADDRESS_____

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DRILL BITS ☐ MACHINE BITS ☐ STRIP BITS ☐

KENNAMETAL

Trade Mark Reg. U. S. Pat. Off.

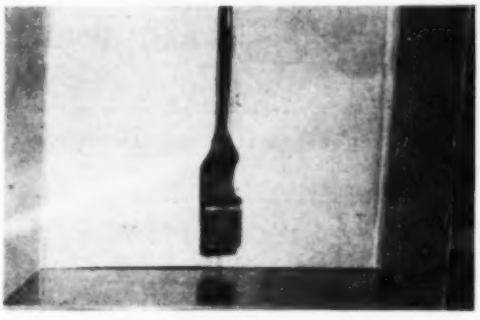
Drill Bits • Machine Bits • Strip Bits • Rock Bits

WRONG METHOD of coupling mine cars—man's left hand is in the danger zone and may be caught if cars come together rapidly.

RIGHT METHOD utilizing Red Jacket "safety" hook enables man to keep his hand well away from bumpers and coupling.

Safety Hook Prevents Injuries In Coupling Mine Cars

A "SAFETY" HOOK in use at the mines of the Red Jacket Coal Co., Red Jacket, W. Va., prevents hand injuries in coupling mine cars, is easy to use and is operated almost automatically, reports J. J. Plasky, training and safety director. As shown in the accompanying illustration, use of the hook permits a man to keep his hand out of the danger zone between the cars. Without the hook, a man must handle the swivel couplings and with a sudden or unusually rapid movement of the cars may easily catch his hand in between. The lower end of the hook is so constructed that it engages the bumper and is automatically dislodged from the link, an important safety feature that makes the device very convenient to use.



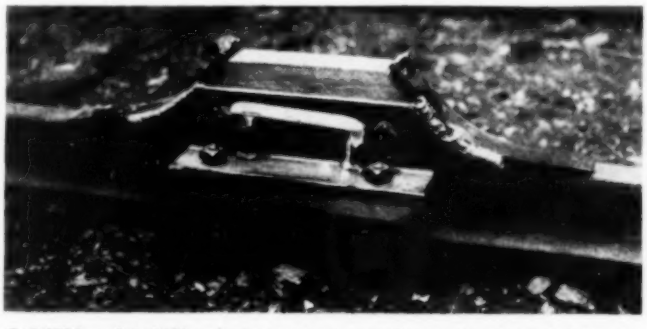
FOR EASY AND SAFE OPERATION, lower end of the hook engages the bumper and is automatically dislodged from the link.

Sturdy "Throw-On" Car-Stop Holds by Friction

A NEW CAR-STOP shown in the accompanying illustrations, first tested in April, 1947, in the Wildwood (Pa.) mine of the Butler Consolidated Coal Co., proved so superior to any of the several stops tried over the years that it was made standard for that mine. Now, after nearly 2½ years of service, it still holds first place in safety and practicability, in the opinion of mine officials.

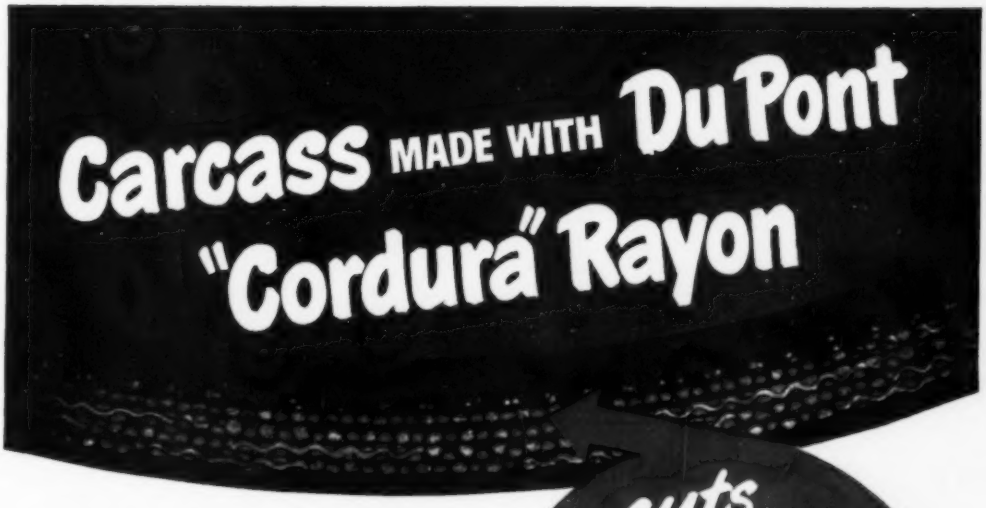
The stops are made for 30-lb rail as follows: two short pieces of 3x3-in angle iron, each having one flange cut short and trimmed to a width of 2½ in and the other cut to car-wheel curvature, are bolted back-to-back against a 1⅝-in wooden filler block. Steel ramps bent to slightly more than car-wheel radius and fitted with small stop blocks at the top are welded to the curved ends of the vertical flanges. Handles are welded to the sides of these vertical flanges. A strip of wood 1 in thick, tapered at the ends and beveled on one side, is bolted to the bottom of each 2½-in flange.

When the stop is tossed onto the rail, as brakemen are likely to do, and not leveled to proper positions, it does not tip off but stays until hit by a car wheel, which forces it to the level or operating position. The weight of



CAR-STOP used at Wildwood mine in operating position on the rail. Contact is made between the wooden filler block and the top of the rail.

Carcass MADE WITH Du Pont "Cordura" Rayon



... cuts conveyor belt weight 10%, increases strength 40%

Those four plies of Cordura* you see in this cross-section of a conveyor belt really pack in strength. Made to replace a conventional 4-ply belt, the "Cordura" Rayon construction uses 29% less fabric and is 10% lighter over-all. Yet its ultimate strength is high—40% above the standard belt. Its stretch is low, less than two-thirds that of the standard at equal loads. And its fastener pull-out strength is higher.

Higher strength and lower stretch used to mean stiffer belts. But this belt of "Cordura" Rayon is more flexible. Its troughability index is 40% higher than that of the standard.

Du Pont "Cordura" High Tenacity Rayon is engineered to provide high strength with low unit weight—and at low cost. It makes possible lighter belts . . . and longer belts.

When you're in the market for a conveyor belt, ask your supplier about a carcass made with "Cordura."

You can also get detailed information about "Cordura" by writing Room 4527, Rayon Division, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware.

*REG. U. S. PAT. OFF.

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

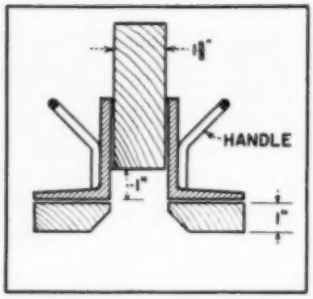
Look to "Cordura" Rayon for these conveyor belt advantages:

- ★ *Greater tensile strength*
- ★ *Longer life*
- ★ *Heavier loads*
- ★ *Improved troughability*
- ★ *Longer lifts with fewer transfer points*
- ★ *Lighter belts that are easier to set up*
- ★ *Resistance to flexing*
- ★ *Resistance to loading impacts*
- ★ *Reduced operating power expense*

DU PONT "CORDURA" HIGH TENACITY RAYON

For RAYON . . . for NYLON . . . for FIBERS to come . . . look to DU PONT

UPSIDE-DOWN VIEW of the car-stop, showing wooden filler block and two wooden strips with beveled ends and beveled on the sides next to the rail. When thrown onto the rail, the stop stays until the wheel forces it to the proper position.



CROSS-SECTION through the center of a new-type car-stop for 30-lb rail that works by friction to effectively hold cars

the car resting on the stop forces it down so that the wooden spacer block rests on top of the rail, thus providing sufficient friction for holding cars on the grades encountered in Wildwood mine, operating in the Thick Freeport seam of coal.

Its operation by friction saves breakage from shock, as compared with a positive stop or one that catches on ties, angle bars or bolts. The heavy steel mine cars with 5-ton loads caused considerable breakage of the more positive types of stops formerly used or tried. In addition to the fact that the new stop does not catch on angle bars, fishplates or bolts, it is applied to the rail with less effort and danger and in less time than any other stop that has been tried at Wildwood. The stop was designed by the safety department of the Butler Consolidated Coal Co. W. P. Vance is general superintendent and C. Zotter is safety engineer for the company.

"Automat" Simplifies Lubricant Handling

NEW OIL HOUSE has a double-deck steel-rail rack (left) for storage of both full and empty lubricant drums. Oil and grease cans are distributed to crews through 75 steel lockers shown on two sides of the building. Full drums are rolled directly from railroad cars onto the top deck of the rack.

DISPENSING TANKS inside building are filled by rolling full drums along top level of connecting rail to spouts at the back of the structure. Empty drums are dropped by a kickback to the lower level of the rack for return to the storage area.

A NEW OIL HOUSE and bulk-lubricant storage rack that is practically a lubricant "Automat" is now in use at the Carswell mine, Coal Division, Eastern Gas & Fuel Associates, Kimball, W. Va. The new unit, which was designed by D. B. Shupe, plant engineer, and Carter Wade, electrical engineer, has not only simplified the handling and dispensing of oil and grease but also permits storage of all bulk lubricants at the mine.

All oil and grease is stored in drums until needed on the top deck of the double-deck rack shown at the left in the upper photo. Full drums are rolled off railroad cars onto the top level of the rack, which is made of steel railroad rail laid to the gage of the flanges of the drums. When the four 400-gal tanks inside the new building require refueling, the drums are easily rolled by hand along a connecting network of rail to the rear of the building, where they are emptied through filler spouts extending through the brick wall. Empty drums are pushed to a kickback, which drops them to the lower track and returns them to the storage area under the full drums.

The new oil house is constructed of brick, concrete and steel and is completely fireproof. Oil and grease cans are distributed to plant and mine crews from 75 steel lockers on two sides of the building. Fire extinguishers and permissible vapor-proof lighting are additional safety features.

New PERMISSIBLE

10-CAP BLASTING MACHINE

APPROVED BY U. S. BUREAU OF MINES

PERMISSIBLE—voltage builds up rapidly with a twist of the handle . . . switch closes at peak of output . . . timing of discharge is limited to 20-30 milliseconds.

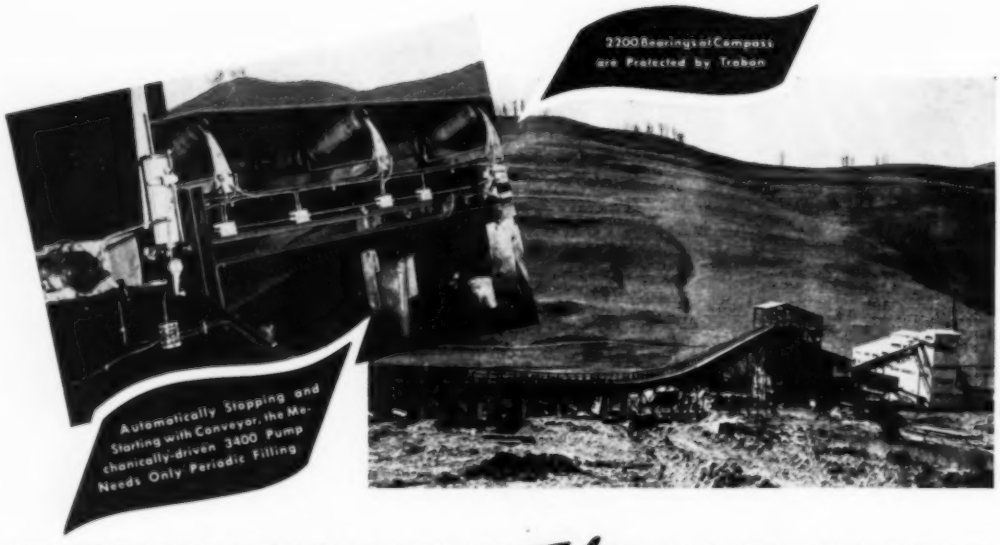
COMPACT—height: including handle, only 8 inches . . . weight: 4¾ lbs. . . . designed to insure firm grip and easy operation.

RUGGED—tough, heavy gage metal case . . all parts made of the finest materials available for their particular function.

HIGHLY WATER-RESISTANT

Give your order to your Hercules representative

HERCULES POWDER COMPANY


2200 Bearings at Compass are Protected by Trabon
Automatically Stopping and Starting with Conveyor, the Mechanically-driven 3400 Pump Needs Only Periodic Filling

ANOTHER PREPARATION PLANT INSTALLS *Trabon* CENTRALIZED LUBRICATION!

Reduced Maintenance Costs and Better Tonnage Flow at Moss Result in Installation at New Elk Creek Plant.

● Clinchfield Coal's new Compass Plant on Elk Creek has a capacity of 7000 tons of sized and washed coal per day. This new tipple and washery located at Overfield, West Virginia, is completely equipped with Automatic and Manual Trabon Centralized Grease Systems on *raw coal conveyors, sizing shaker screens, washers, cones, etc.*

Trabon's excellent performance following the initial installation at Clinchfield's modern Moss Tipple resulted in the selection of Trabon for centralized lubrication at Elk Creek. Approximately 1500 bearings at Moss were protected by the positive force-feed hydraulically-operated Trabon Systems. These completely sealed systems with single indicators at pumping points permitted feeders and lines to be buried under grime and coal dust.

If you are considering the savings and advantages of centralized lubricating systems either above-ground or under-ground at your operation, write or call Trabon Engineering Corporation today for detailed information.

CHECK THESE FEATURES

- ✓ *Trabon is Positive*—Every Bearing Gets Its Full Measured Amount
- ✓ *Trabon is Hydraulic*—Handles Oil or Grease, Using Either Manual or Automatic Pumps.
- ✓ *Trabon Systems are Sealed*—Can be Concealed or Even Buried Under Coal Dust and Grime.
- ✓ *Trabon Has a Single Indicator*—Progressive Feeder Operation Permits Simple, Positive Proof of Lubrication at Pumping Point.

Trabon ENGINEERING CORPORATION

1814 EAST 40TH STREET • CLEVELAND 3, OHIO

Centralized Oil and Grease Systems

News Round-Up

Lewis Sets Three-Day Week Over Operators' Protests

A THREE-DAY WEEK was thrust upon bituminous producers east of the Mississippi when John L. Lewis June 30 ordered curtailment of the work week after miners returned to the pits following their annual vacation, which ended July 5. The order, said Mr. Lewis, did not apply to mines west of the Mississippi. By allowing miners to work beyond the expiration of the contract, which terminated June 30, the mine-union leader shelved his traditional "no contract, no work" policy, at least for the time being.

Mr. Lewis had offered the shortened week as a proposal at the wage talks in White Sulphur Springs, W. Va., but operator representatives had turned it down unanimously. They contended that such action would be an undesirable precedent opening the way to union control of production and prices and would make them liable for prosecution under anti-trust laws. Mr. Lewis issued his order when he stepped outside the conference room to meet newspaper reporters. Operators did not learn of his announcement until about an hour later.

Producers countered by announcing that work notices would be posted at their mines whenever there was work to be done, thus following the recommendation of operator negotiators, who advised "those whom we represent to operate their mines in compliance with the present contract."

Exemption of western producers from the curtailment order was attributed to the irregular supply of railroad cars and to the short supply of coal during last winter's severe weather. As for southern operators, it was reported that Mr. Lewis never had made his three-day proposal at the Bluefield, W. Va., conference, though his order was directed at them as well as other producers east of the Mississippi. Meanwhile, little if any progress was being made toward a contract in the union's talks with southern operators. Conferences all down the line were recessed until July 26.

Though coal stockpiles generally were reported to be adequate, with few industrial consumers having less than a month's supply on hand, a few plants reported as little as ten days' stocks on hand. A steel-industry spokesman stated that the shortened work week would not affect steel output for about four or five months.

Mr. Lewis' order for a three-day week permits maintenance work as usual. Also, cutting crews may work Sunday night provided the coal is not loaded until Monday and stripping machines may remove overburden in advance of the three-day loading period.

Meanwhile, in Philadelphia, union and operator representatives announced July 7 that the anthracite agreement would be extended during negotiations for a new contract. Likewise, in Illinois, the PMWA agreed July 1 to a 31-day extension of the existing agreement with the Coal Producers Association of Illinois.

Elsewhere, in western Kentucky, West Virginia, and Alabama, roving bands of pickets were reported to be interfering with operations at several union and non-union mines. Near Madisonville, Ky., nine non-union mines operated by West Kentucky Coal Corp., Homestead Coal Co., Badgett Mine Stripping Corp. and Blue Valley Coal Co. were shut down late in June and early in July by efforts of UMWA members to organize the workers. By July 6, eight of the mines were reported to be operating again, following temporary restraining orders issued by Circuit Judge H. F. S. Bailey. In Harrison County, W. Va., John Oliviero, operator of a non-union deep mine, was beaten by pickets who sought to close the mine July 15 in accordance with the UMWA three-day-week policy. Earlier, on June 29, roving pickets attempted to shut down four non-union strip pits of the Bittner Fuel Co., Jane Lew, W. Va., during the UMWA vacation period. County Sheriff J. C. Owens threatened the pickets with criminal prosecution.

Meanwhile, in Alabama, seven men were arrested June 23 in connection with a raid by an armed mob on a

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THIS MONTH'S COVER—Miners at the Winton No. 7½ Seam mine, The U. P. Coal Co., who helped set a no-injury record in 1947 and a 1948 safety record that earned them a Holmes Safety Association award this spring. To see "What the Welfare Fund Is Doing" for the miner and what it may mean to the industry, turn to p. 70.

FOR SEPTEMBER COAL AGE

- BETTER COAL RETAILING—How Coal Heating Service is building customer satisfaction and strengthening retail coal markets.
- ROOF BOLTING with small bolts supplementing crossbars cuts falls 70% at Christopher Coal mines.
- MARIANNA PREPARATION—The new 600-tph plant at Mine No. 58, Bethlehem Collieries Corp.
- STRIP-MINE SERVICE CENTER at Hume-Sinclair Coal Co. facilitates maintenance and repair.
- ENTRY-BRUSHING AT WILLIAMS COAL CO. —Methods employed to take 24 in of roof rock.
- MECHANICAL HANDLING OF PREDRIED LOCOMOTIVE SAND using an old mine shaft for storage.
- PLUS OTHER FEATURES, operating kinks, industry news and other material you'll find helpful.

non-union mine of the Cahaba Coal Mining Co., in Shelby County. Three men and a boy were reported to have been struck by members of the mob, who sought to close the mine during the week-long stoppage which began June 13. In addition, six mines of the Tennessee Coal, Iron & R. R. Co., Birmingham, were closed down for several days beginning July 11 by a walkout following the arrest of 10 miners who allegedly beat a motor inspector at the Short Creek mine, July 8. The motor inspector was attacked when he attempted to work more than the union-prescribed three days, saying that he did not understand his job to be affected by the order.

Meanwhile, on July 6 in Washington, Mr. Lewis and other UMWA officials asked the Supreme Court to set aside their contempt-of-court convictions and fines, totaling $1,420,000, for refusing to call off the March, 1948, coal strike. The union charged that the Taft-Hartley Act, under which the injunction was issued, was unconstitutional and that the fines were excessive under the Bill of Rights.

•

Bureau's Synthesis-Gas Tests Are Successful

Full-scale test runs recently carried out at the U. S. Bureau of Mines synthetic liquid fuels demonstration plant, Louisiana, Mo., indicate that a new-type coal gasifier will make a gas suitable for conversion into oil and gasoline by means of the Fischer-Tropsch process (*Coal Age*, July, 1949, p. 70).

Designed to use about 28 tons of pulverized coal per day, 24 tons of oxygen and 35 tons of superheated steam and to produce some 2,000,000 cu. ft. of raw synthesis gas, the gasifier is the second unit to be completed in the projected 100-bbl.-per-day gas-synthesis plant. The first unit to be placed in operation was the huge Linde-Frankl oxygen plant. Units still to be completed are for gas purification, hydrocarbon synthesis and product refining.

•

Pass Ohio Stripping and Illinois Safety Bills

Ohio Gov. Frank J. Lausche is expected soon to sign a new strip-mine control bill recently passed by the state legislature to replace the statute that has been on the books for the past two years. Reported to have been supported by most coal companies, the new law creates a Division of Reclamation within the Ohio Department of Agriculture. The division will be administered by a chief with two assistants.

Under the new law, all strip operators must be licensed by the state, the fee being $50 plus $10 for each acre to be mined during the year following date of issue. Also, a bond must be furnished amounting to $190 per acre of the land to be mined in the year to guarantee grading of spoil banks, planting of vegetation where the land will support it and construction of access roads, fire lanes and earth dams. A board of five will hear appeals from rulings of the division chief.

In Illinois, Gov. Adlai Stevenson recently signed into law a series of nine bills to improve enforcement of state mine-safety statutes. The new laws aim at an end to divided responsibility for enforcement of safety regulations. (*Coal Age*, July, pp 116 and 138). Under the new steup, the State Mining Board's functions are limited to recommending changes in the mining laws and enforcement of safety provisions if lodged with the director, Department of Mines and Minerals.

•

First Natural Gas for New York City Approved

Introduction of the first natural gas available in the New York City area was expected to begin Aug. 1 as the N. Y. State Public Service Commission at the end of June authorized the N. Y. & Richmond Gas Co. to convert some 38,000 customers on Staten Island from manufactured gas.

According to the company, the natural gas will have a heating value of about twice that of its present manufactured gas and new rate schedules it expects to file will save customers $230,000 annually. The gas will be supplied by the Texas Eastern Transmission Co., which has already extended its lines to Staten Island.

Later, in July, the Public Service Commission authorized Consolidated Edison to install 3½ m of mains to carry natural gas in Queens. The gas will be used as a substitute for fuel oil in making manufactured gas from coal, the company said, and will be secured from the Transcontinental Gas Pipe Line Corp.

•

Jermyn-Green Files Bankruptcy Petition

Jermyn-Green Coal Co., Pittston, Pa., July 13 filed a petition for bankruptcy in the Scranton, Pa., federal court, listing assets of $586,263.55, and liabilities of $509,009.91. The company, which employed more than 1,400 men, ceased mining June 24 and did not petition for continuation of operations. Its lease on the three collieries was turned back to the Pennsylvania Coal Co., Scranton, but no indication as to the future of the property was immediately available from officials of that company.

Assets listed included $297,261.50 for machinery and equipment; negotiable and non-negotiable securities, $129,000; stock in trade, $74,488.99; and accounts receivable, $70,076.53. Liabilities included $307,069.69 due some 207 creditors and $154,434.66 due employees for wages. A RFC loan of $350,000 reportedly was authorized June 13 but it had not been received, pending negotiations with the RFC and compliance with its rules.

The company's difficulties came to a head when miners at its Nos. 6 and 14 collieries stopped work June 22 in disagreement with the company's proposal to make the annual vacation payment in five installments instead of the lump sum due. Workers at its Butler colliery accepted the plan. The union reportedly advised employees July 2 to stop work until arrangements were made for paying back wages. Payment for the period ending June 15, due on June 30, was delayed until July 2 when a 43% payment was made. In addition to the balance for that period and the annual vacation payment, wages from June 15 to 25 also are said to be due.

•

Senate Group Approves Mine-Policing Bill

The Senate bill authorizing federal mine inspectors to close coal mines they consider dangerous was approved July 15 by the Senate Labor Committee. The bill, together with a similar one under consideration in the House, had been bitterly opposed by many operators, state mining departments and other groups at hearings held earlier this year. The bills were strongly supported by John L. Lewis and other UMWA officials.

The proposed investigation of the coal industry by the Senate Banking Committee was scheduled to begin July 25, according to an announcement July 15 by Sen. A. Willis Robertson of Virginia, who will conduct the inquiry. The committee is expected to particularly investigate the effects on the industry of the coal-coordinator plan reported in June as under consideration by northern operators.

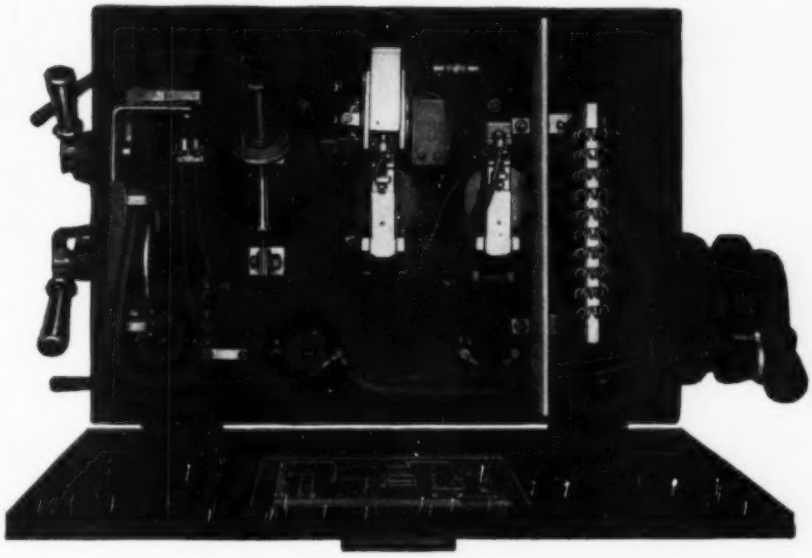
•

BCI Releases Booklet On Air Pollution

A new booklet titled "What's in the Air?" is being distributed to civic groups, municipal officials and teachers as an aid in understanding the cause, effect and control of smoke. The booklet has been prepared by Bituminous Coal Institute under supervision of the Committee on Air Purification, NCA.

The booklet stresses the fact that coal smoke is not the only offender in air pollution and that all fuels smoke when improperly burned. It urges proper adjustment and operation of burning equipment to save money and help keep the air clean.

DROWNED FOR FIVE DAYS-



Yet the O-B Starter is Ready for Work

Five days completely submerged in mine water—and no damage done. Nothing to replace, nothing to be dismantled and baked dry.

That was the recent experience of a southern mine with an O-B Type-BD Motor Starter. One section of the mine flooded, covering all the equipment, including a BD Starter. Five days later the section was pumped out and the electrical equipment was taken out.

Everything had to be baked for several days before the equipment could be used —except O-B's BD Starter. It was allowed to dry normally for a few hours and put right back into service.

We certainly don't recommend this kind of a bath as standard practice for O-B Motor Starters. But it does prove once again that the simple, rugged construction of O-B Starters really stands up under hard mine service.

O-B Motor Starters are available in both gasproof and open types. Write for complete information.

3018-M

Specify O-B Motor Starters For All Motor-Driven Equipment—They're Designed to Stand Up Under Heavy Mining Service.

Ohio Brass

MANSFIELD, OHIO

CANADIAN OHIO BRASS COMPANY, LTD
NIAGARA FALLS, ONTARIO

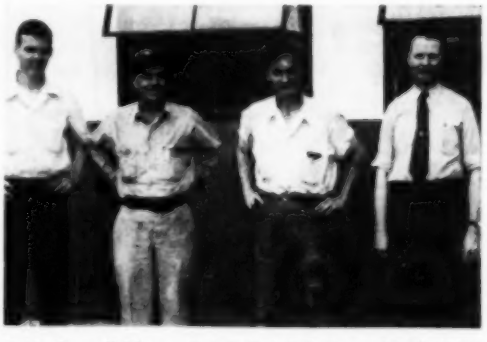
Officials at the Bunker Mine, Trotter Coal Co., Cassville, W. Va.—Charlie Ponceroff (seated, left), section foreman; Homer Johnson, inside chief mechanic; E. W. St. Clair, general superintendent; L. A. Connor, assistant superintendent; and Howard McKelrath, general mine foreman. Standing: D. C. Vance (left), inside construction foreman; C. A. Mick, Robert Rackley, H. A. Riley, Boyd Tennant, Archie Bono, John Snyder, and Earl Walden, section foremen.

COAL MEN ON THE JOB

Geo. Esser (left), president, Virginia Coal Operators' Assn.; Judge Charles I. Dawson, counsel, Harlan Coal Operators' Assn.; John D. Battle, NCA executive vice president; and L. C. Gunter, president, Southern Appalachian Coal Operators' Assn.

Robert McCliment (left), mine foreman, Logan No. 4 mine; Theodore Orr, superintendent, Logan Nos. 3 and 4 mines; and Ned Westover, chief mechanic, Logan No. 4 mine, Johnstown Coal & Coke Co., Beaverdale, Pa.

James Brown (left), chief mining engineer; Fred Bieler, general superintendent; and P. W. Galeener, superintendent, Green Valley mine, Snow Hill Coal Corp., Terre Haute, Ind.



Bobby Brown (left), payroll clerk; O. L. Bullock, superintendent; W. Buchanan, supply clerk; and D. R. Hampton, bookkeeper, Caney Creek Mining Co., Greenville, Ky.

7 Tough Tests prove these YELLOW JACKET Cables are safe

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JOHN J. FOSTER (left), formerly assistant vice president, has been named assistant to the president, Island Creek Coal Co., Holden, W. Va. Mr. Foster, who first joined Island Creek in 1911 and was general manager until his advancement to assistant vice president last fall, will continue to coordinate industrial and community relations for the company and subsidiaries, in addition to other duties. R. Glen Lazell (right) was appointed engineering and research assistant on operating and engineering problems, with particular emphasis on new developments. Mr. Lazell joined the company in 1922, and until his appointment as assistant to the vice president in charge of operations last fall was general superintendent.

Personal Notes

James L. Hamilton, manager of northern mines, Republic Steel Corp., Uniontown, Pa., has been named vice president in charge of operations, Island Creek Coal Co. and subsidiaries, Holden, W. Va. Mr. Hamilton, who will join Island Creek Aug. 15, succeeds Raymond E. Salvati, recently named president. A graduate of Penn State College, Mr. Hamilton was first associated with the engineering department of the Youngstown Sheet & Tube Co. He joined Republic's northern division in 1934 and became manager of mines in 1944. He is currently president of the Coal Mining Institute of America.

R. L. Stearns, vice president, Stearns Coal & Lumber Co., Stearns, Ky., since 1933, has been elected president of the company, succeeding **J. E. Butler,** who retired July 1 after 46½ years of service with the organization. Mr. Stearns, who joined the company on his graduation from Northwestern University in 1926, is the third generation of the Stearns family to be president. The company was founded by his grandfather, J. S. Stearns, who was president from 1902 until his death in 1933. His father, R. L. Stearns, served as president from 1933 until his death in 1939. Mr. Stearns, Jr., is a director of the National Coal Association and of a number of other coal associations and is widely known throughout the industry. Mr. Butler first joined the Stearns Coal & Lumber Co. in 1903 as general manager, which position he held until Aug. 1, 1939, when he was elected president. Mr. Butler has for many years been active in industry affairs, serving as a director of many coal associations and participating in various community and state organizations.

Joseph B. Burns, superintendent, Harris mine, Colorado & Utah Coal Co., Mt. Harris, Colo., has been appointed manager of mines for the operation and for the Red Wing mine, Colowyo Coal Co., Axial, Colo., with headquarters continuing at Mt. Harris. The office of assistant to the president has been discontinued and **H. C. Marchant** has been named special representative and will assist the president on special work assignments.

DR. LOUIS C. McCABE, former chief, Coal Division, U. S. Bureau of Mines, and for the past two years director of the Los Angeles Air Pollution Control District, rejoined the Bureau last month. Dr. McCabe will serve as chief of the Bureau's air and stream pollution prevention research, with headquarters in Washington, D. C., and also as assistant chief of the fuels and explosives division.

Peabody Coal Co., Chicago, has announced the retirement under a program adopted last year of 12 officials and employees, including **George W. Reed,** vice president in charge of sales, who joined the company in 1916, and **Walter A. Fisher,** treasurer, associated with the company for 50 years. It also announced that **Frank L. White,** formerly mining engineer, had been elected assistant vice president. **H. Dodge Freeman** has been promoted from assistant chief engineer to mining engineer. **George H. Ember,** engineer, has succeeded Mr. Freeman as assistant chief engineer. Employees in the operating department retiring under the company's program included **William A. Brewster,** supply clerk, West Frankfort, Ill.; **Fred Kline,** foreman, Harrisburg, Ill.; **Lucian H. McElvain,** supply clerk, Du Quoin, Ill., and **Amon T. Young,** faceboss, Taylorville, Ill.

Karl M. Marquis has been elected chairman of the board of directors, Warner Collieries Co., Cleveland. Mr. Marquis continues as president, W. H. Warner & Co., Inc., sales agents for Warner Collieries. He first joined the organization in 1928 as assistant sales manager.

Samuel A. Crozer, formerly vice president, has been elected president of the Crozer Coal & Land Co. and the Page Coal & Coke Co., Elkhorn, W. Va., succeeding **Edward C. Page,** Philadelphia, Pa., who is retiring after 35 years of service with the organizations. Mr. Crozer, who also is president of Stroud & Co., Philadelphia investment company, has been active in the companies for many years. **Robert T. McCracken,** an attorney who has been a member of the boards of the companies for some years, was elected vice president.

Thomas J. Thomas, assistant to the president, Burlington Lines, and president of the railroad's Valier Coal Co., Chicago, since 1925, retired June 30. Mr. Thomas, who has been associated with the Burlington since 1920, served during the war as associate deputy, Solid Fuels Administration for War, and as director of production and director of health and safety, Coal Mines Administration. J. F. McAlpine, assistant general purchasing agent, Chicago, Burlington & Quincy R. R., has been named to succeed Mr. Thomas as president of the Valier Coal Co., in addition to his present position. Mr. McAlpine joined the Burlington organization in 1909 and has held various positions in the operating and purchasing departments. **John G.**

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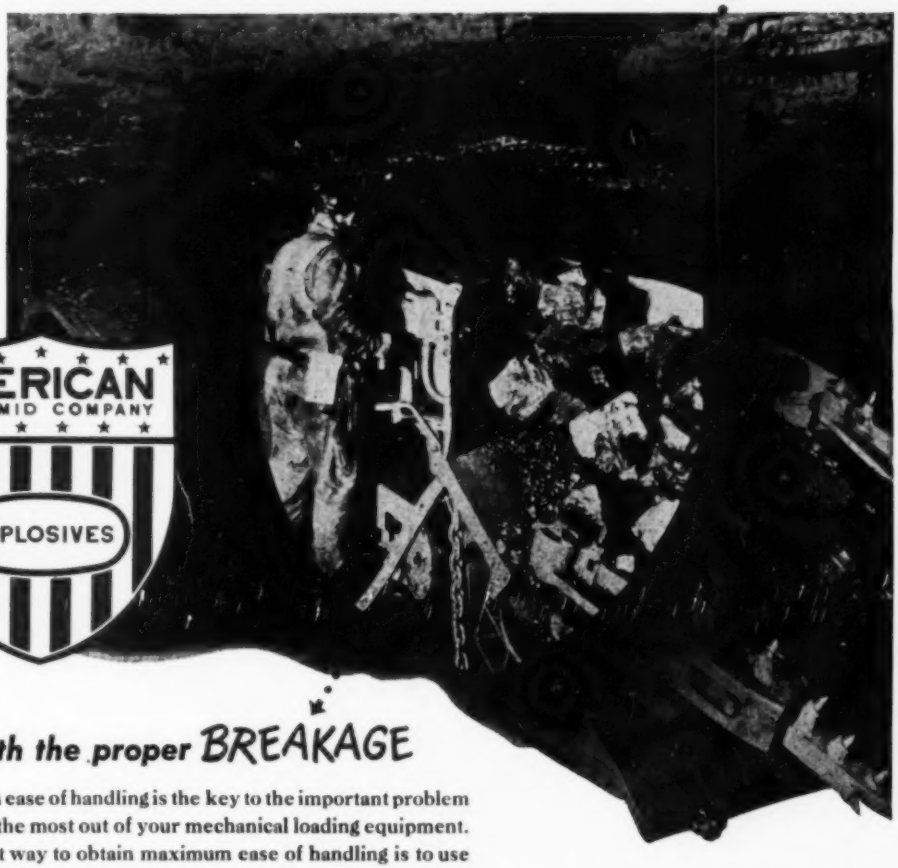

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Crawford, fuel engineer for the railroad, and general manager and purchasing agent for the Valier Coal Co., also retired June 30. Mr. Crawford has been fuel engineer since 1906 and an officer of the coal company since 1925.

Charles W. Stickler, Jr., has resigned as associate professor in charge of research related to mechanical mining, Penn State College, to join Robinson & Robinson, mining engineers, Charleston, W. Va. Mr. Stickler will specialize in industrial engineering related to mining, in addition to general mining engineering, and will make his headquarters at Reading, Pa.

Martin Hooper has been named superintendent of the Illinois state mine-rescue station at Eldorado, Ill., succeeding **Donald Vinyard.**

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Obituaries

W. T. Williams, 79, for many years active in the coal industry of southern West Virginia, died June 22 at his home in Bluefield, W. Va., following a two-months' illness. Mr. Williams was born in Wales and came to this country at an early age. He worked as an engineer for the Lehigh Valley Coal Co. until 1901, when he went to southern West Virginia. He moved to Bluefield in 1909 and for many years was active in the organization and operation of a number of coal-producing companies.

•

New Developments

•The Hanna Coal Co., last month reportedly was negotiating for the purchase of Mine No. 2 of the Wheeling Township Coal Mining Co., Duncanwood, Ohio. The property, which was a captive operation controlled by the Goodyear Tire & Rubber Co., was closed June 24. Depletion of coal reserves, equipment-replacement needs and high cost of operation were cited by the management as factors in the shutdown. If acquired by Hanna, the tipple would be used to load coal mined at the Georgetown stripping until the new plant now under construction is completed next year, according to reports. While coal reserves do not justify equipping the mine with the modern machinery required, it is possible that it could be mined in the future through Hanna's Dun Glen mine nearby, it was said. The mine formerly employed 400 men.

•Plans reportedly are under way by the Kaiser Co., Inc., Sunnyside, Utah, for the development of some 30,000,000 tons of high-grade coking coal recently discovered by company engineers in the Book Cliff area of Carbon County, Utah, near Price. The company holds a 2,650-acre lease from the U. S. Department of the Interior, together with a 480-acre lease from the state of Utah, and exhaustive test drilling is said to have indicated a coal seam of 11 to 14 ft. The underground operation under consideration would be designed to supply 750,000 tons annually to the company's Fontana steel plant, it was reported.

•Acquisition of the Exeter Colliery, Exeter, Pa., and plans for re-opening of the mine on July 5 were announced in mid-June by the Kehoe-Berge Coal Co., Pittston, Pa., The mine, which was closed May 3, had been operated in recent years by the Payne Coal Co., Wilkes-Barre, and employed 500 men. With the addition of the colliery to its other operations, Kehoe-Berge is expected to be producing at the rate of 1,000,000 tons annually by next year, employing more than 2,000 workers.

•Alden Colliery, Alden Mining Co., Alden, Pa., closed since early June, has been taken over by the Susquehanna Collieries Division, M. A. Hanna Co.; and was to be re-opened July 11. According to reports, the Alden breaker will not be re-opened but coal from the operation will be prepared at Susquehanna breakers in Nanticoke and Glen Lyon. W. H. Moore, formerly superintendent, Susquehanna Mine No. 6, Glen Lyon, has been named superintendent of the Alden colliery. Approximately 200 of the 250 men formerly employed at the mining plant were to be retired.

•The Sinclair Coal Co., Kansas City, Mo., reportedly was planning to open about July 1 a new strip mine near Tracy, Iowa, that is expected to be the largest producer in Iowa. The company is understood to have more than 12 sq m of coal property available for stripping and to be planning production of 20,000 tons a month. A four-track tipple and other equipment is being moved to Tracy from a Sinclair operation at Red Oak, Okla., recently closed because of high operating costs. Stripping will be done with a dragline equipped with a 175-ft boom and 10-yd bucket also being moved from Red Oak. The company is opening an office in Des Moines, with C. W. Veskerna, Sinclair representative in Iowa for many years, district sales manager in charge.

•Development of some 26,000 acres of coal lands near Farmersville, Ill., is being planned by the Freeman Coal Co., Chicago. Drilling tests are reportedly now under way on the property, which was acquired about six months ago, and actual development work is expected to be begun next year. The company is understood to be planning to move to the site the tipple and surface and underground equipment from its Bobby Dick mine, near Herrin, Ill., which was closed down June 23 because of lack of available coal. Some 14,000,000 tons of coal had been hoisted from the Bobby Dick mine during its 42 years of operation.

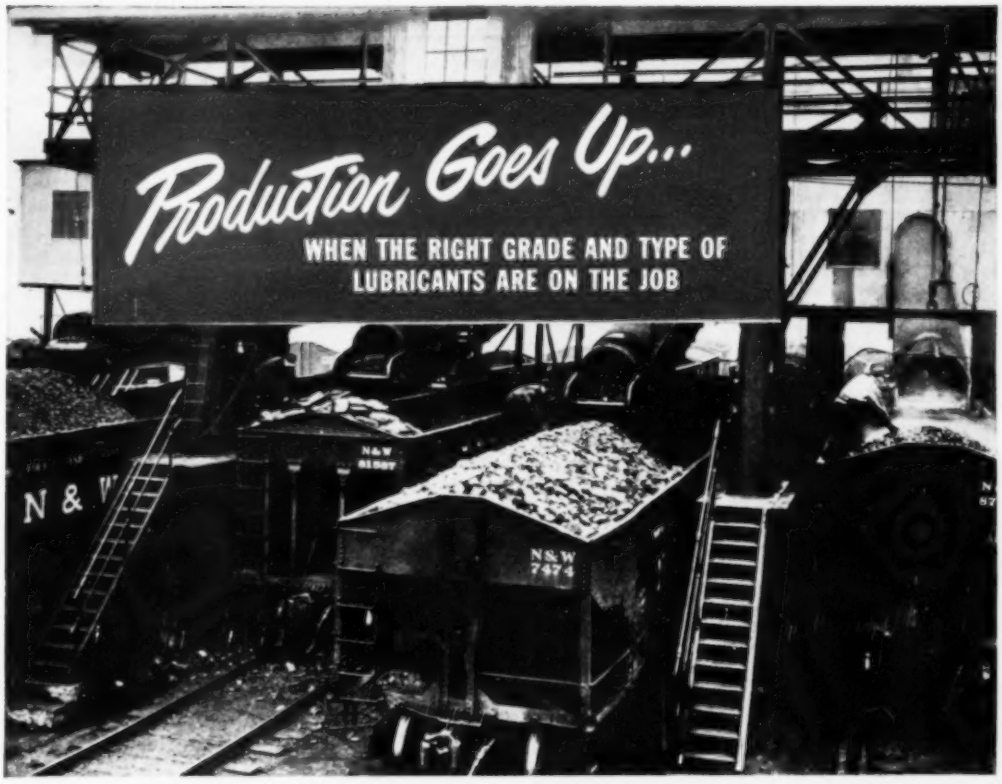
Coal Briquetting Explored At Wyoming Conference

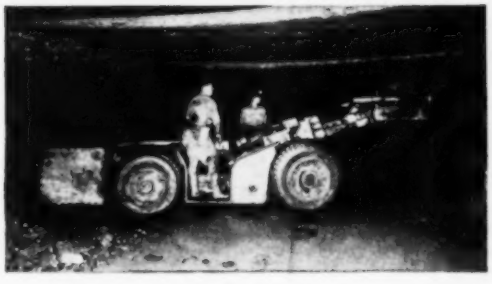
BRIQUETTING OF COAL in all its phases, with particular attention to preconditioning and binders, was the subject of the Coal Briquetting Conference held at Laramie, Wyo., June 24-25, under the auspices of the Natural Resources Research Institute of Wyoming. The institute is conducting, among other projects, a study of the problems involved in briquetting Wyoming sub-bituminous coals.

Standard briquet-plant operation was the subject of the opening paper by J. M. Moore, briquet-plant superintendent, C. Reiss Coal Co., Ashland, Wis., with Neal Rice, NRRI coal-research chemist, and Clayton S. Wolf, coal-research engineer, University of Utah Engineering Experiment Station, Salt Lake City, Utah, as co-chairmen. Outlining the sequence of operations in a standard plant—drying, crushing, fluxing or mixing in the binder, pressing, cooling and loading—Mr. Moore pointed out that there is no standard process and that every plant differs somewhat in procedure. Fluxing is the most critical operation.

Discussion brought out that oil-treating of coal introduces difficulties in briquetting because the oil dissolves the usual petroleum binder. Calcium chloride, however, seems to have no effect. Good distribution of the various sizes in the crushed coal, it was pointed out, results in a better briquet with less binder.

Results being attained by high-pressure briquetting—20,000 to 30,000 psi—without binder were discussed by Paul D. Haigh, chief engineer, Komarek-Greaves & Co., Chicago, in a paper on trends in the design of briquetting machinery. One such plant in Canada is preparing a locomotive fuel and another in Duluth an almond-size briquet for home stokers. The stoker plant is using New River coal ground to 96 per cent through 100 mesh, but no doubt the same





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equipment could easily prepare other coals. The briquets, Mr. Haigh declared, are absolutely weatherproof, do not require cooling and are stronger after six months than when made. The coal is heated to 180 deg and flows in the press—no fusing.

Under the topic "Briquetting Plants I Have Known," A. L. Stillman, director, research department, Berwind-White Coal Mining Co., New York, briefly described a number of foreign and United States plants built in the past. A discussion of methods of evaluating briquet quality, by Charles C. Boley, NRRI coal-research engineer, and Mr. Rice, concluded the opening session. Messrs. Boley and Rice described both physical and chemical tests and detailed particularly the NRRI method of conducting actual burning tests in a stove.

With L. D. Krehma, development engineer, Socony-Vacuum Oil Co., Kansas City, Mo., and B. W. Brown, NRRI research chemist, as co-chairmen, the second session was devoted to binders for briquetting. Leading off with a discussion of the availability and known properties of spent sulphite liquor solids as an adhesive agent, Averill J. Wiley, technical director, Sulphite Pulp Manufacturers' Research League, Inc., Appleton, Wis., in a paper read by Mr. Brown, made the following points:

"1. Sulphite liquor solids are potentially available in tremendous quantities at costs that should make them quite attractive in the briquetting field, provided satisfactory applications can be worked out.

"2. Past experience has been extensive but indicates the use of unmodified sulphite liquor solids in the adhesive and binding fields to be limited by hygroscopicity resulting from its sugar content.

"3. A new spent-liquor product from which the sugars have been almost completely removed by biological methods will be available in the relatively near future."

Starch has been used in some cases where water resistance is not a vital factor and where the process can stand as much as $1 per ton for binder should be investigated, declared T. A. Bruce, Corn Products Refining Co., San Francisco. A good binding job can be done, he stated, with 1% solid corn starch. The ash content of corn starch, he added, is 1/100%. There are no residual sugars and therefore the product does not attract moisture. There is no difficulty with bacterial action and starch is available in any needed quantity. If water-repellent properties are desired, asphalt can be mixed with the starch. Discussion brought agreement that the starch-asphalt mixture was a good binder, low in cost, waterproof and good for reducing smoke.

Analyzing asphalt specifications for briquetting various types of coal, L. W. Corbett, asphalt research chemist, Husky Refining Co., Cody, Wyo., made the point that equally good briquetting with wide variations in type of asphalt binder and specifications indicate "that possibly some specifications are not too important." Further research, he felt, could lead to more economy in binder use with a better quality of briquet.

Reporting on tests on asphalts from certain Canadian crudes, E. Swartzman, engineer, Fuels Div., Canadian Bureau of Mines, Ottawa, in discussing the relationship of the quality to the properties of the resultant briquets, summarized these findings:

"It has been demonstrated that in so far as asphalts prepared from Leduc crude are concerned, within the softening range of 150 to 165 deg C (R. & B.), certain physical properties are required before the material, when used as a binder with coal, results in briquets with high stability and compressive strength. Although it has been shown that the stability of briquets is related to the viscosity and the compressive strength to the penetration characteristics of the asphalt, because of the inconsistencies it is felt that some other property of the asphalt may more accurately assess its value as a briquetting binder.

"Basically, the strength of a briquet will depend upon the strength of the bond between the asphalt and the coal particles, and it may be possible to assess this by means of a suitable test for determining 'adhesiveness.' As adhesiveness is related to the wetting properties of the bonding material, it would appear that evaluation of the surface tension of the asphalts may be the best guide to the quality of a suitable briquetting asphalt."

Lengthy discussion brought out varying opinions as to the effect of various specifications on briquet quality, with a number of those present making the point that results in actual practice was the best proof of the pudding. It was generally concluded, however, that present physical specifications did not reflect the asphalt qualities really affecting briquet quality and that further research into asphalt constituents might reveal quality guides that could be used for better results. In other words, this research might make it possible to specify according to constituents rather than the whole.

Coal type and size consist also were pointed out as factors in the final results. Fortunately, a number of speakers pointed out, the usual mine or hammer-mill product normally provides the right consist. However, if more fines are added or an attempt is made to remove or reduce the coarse fraction as fed to the mixer, trouble normally can be expected.

Discussing the availability of asphaltic binders as distinguished from their characteristics, Mr. Krehma declared that there will be an ample supply over the foreseeable future.

A thumbnail sketch of Alberta coals, their production, preparation and utilization, and the problems connected therewith, was presented by W. A. Lang, senior research chemist, Research Council of Alberta, at the opening of the final session, with P. T. Miller, dean emeritus, University of Wyoming and NRRI consultant in chemistry, and Mr. Swartzman as co-chairmen.

Specifically on briquetting, Mr. Lang declared that it was a major factor in Alberta thinking, both as a means of utilizing fines to which consumers, particularly the railroads, object, and as a possible means of upgrading the lower-rank coals of the province. Drying low-rank coals and using asphalt as a binder is not the best answer, Mr. Lang felt, because the resultant product does not have the desired firing characteristics. One possible way of overcoming the problem is blending in coking coal, but smoke output is increased. A second is carbonizing and briquetting the char. It, however, is abrasive and porous. Experiments have been conducted with both processes but the problem of doing the job economically still remains.

Summarizing other test work in the briquetting field, Mr. Lang declared that either the natural or hammer-mill product normally has the proper size consist for briquetting. Also, of the various binders, asphalt seems the best at present. Rattler and other tests are used to determine briquet quality. In general, Mr. Lang reported, higher rattler and drop losses accompany lower-penetration binders and vice versa. There is less correlation between compression values and penetration but the trend is toward lower values with high penetration. The council is now trying, without much success, to eliminate pressing in making a solid fuel.

In the absence of Edward Prostel, superintendent and director, V. F. Parry, supervising engineer, Subbituminous and Rocky Mountain Coals Section, U. S. Bureau of Mines, Golden, Colo., described the briquetting of lignite char at the Dickinson (N. D.) plant of Dakota Briquets & Tar Products, and then went on to discuss possible methods of cutting the cost and speeding up the process of getting materials to the press in briquetting. This involves drying and handling the fines, and Mr. Parry explained the fluid-bed drying process developed at Golden (July, *Coal Age*, p. 73) and suggested ways of applying it to the briquetting process.

MEETINGS

- A.I.M.E.: mid-year meeting, Sept. 25-Oct. 1, Columbus, Ohio.
- National Safety Council: 37th National Safety Congress, Oct. 24-28, Stevens, Congress and Morrison Hotels, Chicago.

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Per cent elongation	250	495
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Per cent depreciation in tensile strength	40	40
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Tensile strength, min. lb in.	40*	110

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OFFICIALS AND SPEAKERS—R. R. Bowie (left), president, Bowie Coal Co., and association president, giving the address of welcome at the banquet; R. S. Walker, president, Bradford Coal Co., and MPA vice president, presiding at the annual meeting; Charles B. Baton, president, Greensburg-Connellsville Coal & Coke Co., toastmaster at the banquet; and M. A. Crawford, MPA general counsel.

SPEAKERS—John Griffen (left), McNally-Pittsburg Mfg. Co.; George A. Lamb, manager of business surveys, Pittsburgh Consolidation Coal Co.; and John D. Battle, executive vice president, National Coal Association, banquet speaker; Dan E. Dunmire, state forester, Clarion, Pa.

Mineral Producers Hold Annual Meet

MORE THAN 400 strip-mine operators, industry executives and guests attended the all-day annual meeting of the Mineral Producers' Association, Kittanning, Pa., held June 24 at the Wm. Penn Hotel, Pittsburgh, Pa. Following the business session in the forenoon, at which officers for the coming year were elected, the group heard a series of papers on varied topics in the afternoon and concluded the meeting with the annual banquet in the evening.

Speakers at the afternoon meeting included M. A. Crawford, the Association's counsel, who analyzed the laws affecting the industry passed at the 1949 session of the Pennsylvania Legislature; John Griffen, McNally-Pittsburgh Mfg. Co., "The Preparation of Strip-Mine Coal"; George A. Lamb, manager of business surveys, Pittsburgh Consolidation Coal Co., the long-range future of the industry in "The Outlook for Coal"; Dan E. Dunmire, state forester, Clarion, Pa., "Reclamation and Utilization of Strip-Mine Areas," a study of results achieved in planting and use of stripped lands.

R. R. Bowie, president, Bowie Coal Co., and president of the Association, opened the banquet with an address of welcome and introduced Charles B. Baton, president Greensburg-Connellsville Coal & Coke Co., who served as toastmaster. Speaker of the evening was John D. Battle, executive vice president, National Coal Association, who pointed to the trend toward a more centralized government and emphasized that business men should pay increasing attention to government activities and growth. Stressing that the maintenance of the free enterprise system is of prime importance to all, Mr. Battle said that a great segment of our citizenship still was not convinced that our over-all system of free enterprise is the best in the world.

Officers re-elected at the meeting were: president, Mr. Bowie; vice president, R. S. Walker, president, Bradford Coal Co.; secretary-treasurer, R. T. Laing; and general counsel, Mr. Crawford. Named as directors of the association for two-year terms, in addition to the above officers, were: W. C. Altwater, Pittsburgh & Shawmut Coal Co.; W. B. Bannister, Pittsburgh Coal Co.; Charles B. Baton, Greensburg-Connellsville Coal & Coke Co.; John R. Brunot, Irwin Gas Coal Corp.; Harry W. Findley, West Freedom Mining Co.; Harry D. Ford, Ford & Gaskill; A. D. Grasso, Grasso Coal Mining Co.; W. A. McBride, Jefferson Coal & Coke Corp.; Alan R. Davidson, Twin River Co.; and F. B. Wood Sr., F. B. Wood Coal Mining Co.

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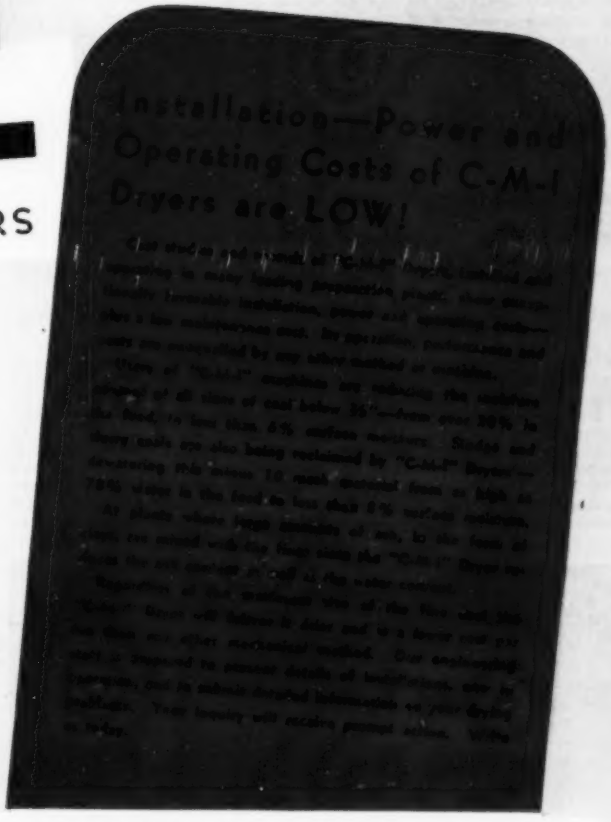

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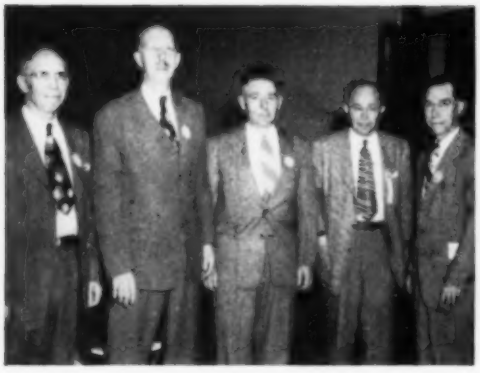


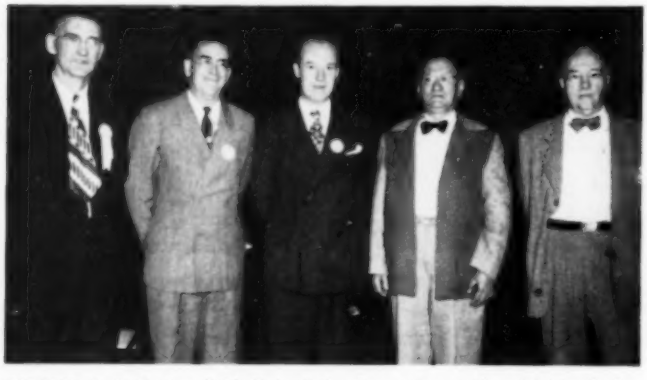
MINING—I. M. Charles (left), The Union Pacific Coal Co.; Dr. L. E. Young, consulting engineer; W. C. Painter, Joy Mfg. Co.; C. M. Schloss, Schloss & Shubart; and D. E. Renshaw, Westinghouse.

PREPARATION—Carl S. Westerberg (left), executive engineer, Utah Fuel Co.; J. D. Price, superintendent, coke ovens, Colorado Fuel & Iron Corp.; and Clyde E. Osborn, Western Machinery Co.

Rocky Mountain Coal Mining Institute

Research in Mining and Utilization, Training Engineers, Coal Washing, Wheels, Automatic Hoisting, Induced Electrical Shock, Trackless Mining of Thick Coal and Safety in Mechanical Mining Feature 45th Meeting

MINING, preparation, safety and education and research were the themes of the 45th regular meeting of the Rocky Mountain Coal Mining Institute, Hotel Colorado, Glenwood Springs, Colo., June 27-29. The program was developed by a committee headed by C. M. Schloss, of Schloss & Shubart, Denver, Colo. With A. F. Krippner, of Krippner & Polley, Denver, general meeting chairman, as toastmaster, the banquet address was delivered by Vernon S. Peterson, mid-continent manager, E. I. du Pont de Nemours & Co., Inc. Glenn E. Sorenson, general manager, Kemmerer Coal Co., Kemmerer, Wyo., was elected president of the institute for the coming year, succeeding Fred W. Koelling, superintendent, Stag Canon Branch, Phelps Dodge Corp., Dawson, N. M.



OFFICERS—F. W. Koelling (left), Phelps Dodge Co., retiring president; W. W. Wheeler, Lion Coal Corp.; D. F. McElhattan, Mine Safety Appliances Co.; Clement Audin Sr., Champion Coal Mining Co.; and Fred W. Whiteside. Messrs. Wheeler, McElhattan and Audin were named to the executive board and Mr. Whiteside was re-elected secretary-treasurer.

The goal in research, said J. D. Morrow, president, Bituminous Coal Research, Inc., Pittsburgh, Pa., in opening the first technical session, with Mr. Koelling presiding, is protecting present markets and gaining new ones. That necessitates looking ahead several years. Summarizing BCR organization, how it operates, its income and how it is spent, Mr. Morrow pointed out that one-sixth of the income is derived from outside the coal-mining industry, indicating that others, at least, have confidence in the future of the industry.

Briefly detailing some of the BCR projects, such as the smokeless heater, smokeless warm-air furnace, smokeless steel boiler, the downflow stoker, overfire air jets for smoke elimination, work in promoting the use of coal for air-drying crops, bin-feed and ash-removal studies, locomotive cinder emission, size consist of locomotive coal for higher efficiency, spreader stoker design and smoke and fly-ash reduction, fan-blown kitchen ranges for close temperature control, and gasification, Mr. Morrow declared that a second important line of work is obtaining facts on what makes a piece of coal burn and how it burns. This is vital in such fields as gas-turbine development, where very high burning rates prevail.

Low-pressure hydrogenation of coal to get away from some of the problems in high-pressure high-temperature conversion is another research job now going forward. Outside BCR, some five coal companies are working on the production of chemicals from coal at low pressures and temperatures. Another research project is determination of the way coke oper-

RESEARCH, WHEELS AND EDUCATION—J. B. Morrow (left), chairman of the board, Pittsburgh Coal Co.; F. E. Rhine, Sterling Steel Casting Co.; and Albert M. Keenan, Colorado School of Mines.

SAFETY—Eddie Morgan (left), federal inspection; John A. Garcia, New Mexico; Thomas Allen, Colorado; Kirk V. Cammack, U.S.G.S.; R. H. Dalrymple, Utah, and Lyman Fearn, Wyoming.

ates in a blast furnace, which already has resulted in a proposal for a blending plant for ore, limestone and coke for higher efficiency and a lower coke consumption.

More support is necessary if coal research is to yield the maximum returns, declared D. H. Pape, Sheridan, Wyo., in opening the discussion. The first locomotive turbine, said Mr. Morrow in response to a question, should be delivered by the end of the year and probably will go on the rails early in 1951. Burning coal at the high rates required has been a real problem and research men are now working on slagging the ash in a brick chamber. Work also is being done with a Houdry turbine loaned by the Bureau of Mines.

The newly installed coal curriculum of the Colorado School of Mines was described by Albert M. Keenan, associate professor of mining and chief of the coal division, Golden, Colo. Installation of the course reflects increased demand for coal-mining technicians and the changing fuel picture, which is enhancing the importance of the western mining industry. The course includes training in human as well as mining engineering and of 13 men now taking it, including 12 who transferred from metal mining, five will graduate next spring. In addition, the foundations are being laid for a course of graduate study. The school, Prof. Keenan reported, now needs help in attracting men to the coal industry, in provision for summer or other vacation employment and in jobs after graduation.

The Golden curriculum, declared Thomas Allen, head of the Colorado state mine-inspection department, will go far toward relieving a terrific shortage of engineers and should be supported. A major service it can render, said Burt B. Brewster, *Salt Lake Mining & Contracting Review*, would be lending dignity to the profession. Golden supplied many men for coal-mining service, Mr. Morrow reported, and they have fitted in well. More stress should be laid on English and college graduates should be able to handle men a little better. To get boys interested, it would be well to work on high school principals. Scholarships also are a real help.

Financial help is a real factor in getting boys to take mining engineering, Mr. Pape declared. More is needed. It also would help materially, said Kirk V. Cammack, United States Geological Survey, Denver, if mining companies made it plain that a job and a future were waiting upon graduation.

Reviewing wheel history in a discussion of the manufacture and use of mine-car wheels, F. E. Rhine, Sterling Steel Casting Co., E. St. Louis, Ill., pointed out that with grey-iron wheels the chill is less over the spokes, leading to flat spots. Pounding as a result of unbalance also can result in flat spots as well as in wear on the rails. Grey-iron wheel manufacturers, he continued, have gone to double-webbed or plated wheels to eliminate flattening, but "even this has not been the answer." As a result, the cast and rolled-steel wheel has been developed and "is rapidly taking the lead." Such wheels match the growth of mechanization elsewhere in the mining cycle and thus, by reducing transportation delays, enables this mechanical-mining equipment to function more efficiently.

From the hardness standpoint, said Mr. Rhine, there are three types of cast-steel wheels being marketed today: (1) flame-hardened, (2) water- or oil-quenched, both with a tread hardness of 350 to 400 Brinell, and (3) the completely alloy heat-treated unit with a uniform hardness of 240 and ample ductility. Therefore, a flat spot will roll out in 10 to 14 days and the wheel will not break under normal operating conditions. "After considerable experimental work, there has been developed a balanced-design cast-steel wheel that provides smoother operation, requires less power to move a trip and reduces the wear on track and bearings, thereby cutting maintenance costs acutely."

To get the maximum service from such wheels, only the best mechanics should be used in wheel work and "the operating or maintenance departments at mines must cooperate by seeing that wheels are applied with bearings properly adjusted." To facilitate this, Mr. Rhine concluded, "our company has recently worked out an assembled complete truck and stub-axle unit with seals that automatically hold grease in and foreign matter out." It includes a permanent adjusting and locking nut for the bearings. "All this means that lubrication costs are tremendously reduced and the life of wheels and bearings greatly extended."

Both chilled-iron and steel wheels have their place, declared W. H. Bachman, C. S. Card Iron Works, Denver, in opening the discussion. Chilled wheels, under ordinary conditions, show less wear, steel wheels less breakage but more rail wear. Chilled wheels show a greater dampening effect with less stress on the bearings. One answer to flat spots, said Mr. Allen, is better provision for controlling the movement of cars. Commenting on this, I. M. Charles, chief engineer, Union Pacific Coal Co., Rock Springs, Wyo., reported that as a result of war trouble new cars were bought without brakes. They cannot be spragged. Results have been very satisfactory and safety has been promoted as a result of elimination of the accidents formerly experienced with brakes.

Defining research as a cheaper and better way of doing things, Dr. L. E. Young, consulting engineer, Pitts-

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EQUIPMENT APPROVALS

Four approvals of permissible equipment were issued by the U. S. Bureau of Mines in June, as follows:

Joy Mfg. Co.—CF312 scraper hauler; one motor, 60 hp, 500 volts, ac; Approval No. 2-671A; June 6.

American Mine Door Co.—Type U rock-duster; one motor, 20 hp, 230 volts, dc; Approval No. 2-672; June 6.

Lee-Norse Co.—MT-22 drill truck; three motors, 2, 3 and 5 hp, 250 and 500 volts, dc; Approvals Nos. 2-673 and 2-673A; June 15.

Joy Mfg. Co.—T2-5APE/F truck; two motors, each 4 hp, 250 and 500 volts, dc; Approvals Nos. 2-674 and 2-674A; June 17.

burgh, and president, AIME, opened the second session with a declaration that more funds are needed for promoting productive efficiency and conservation in coal mining. Specifically, Dr. Young, recounting past and present advances in the art of mining, recommended study of the physical characteristics of the materials encountered in mining in connection with such new developments as the mining-and-loading machine and roof pinning, as well as in such old problems as rock bursts.

Now, said Dr. Young, mines are being built to take advantage of the equipment available, operators are getting away from the handicaps of tradition and coal mining is making much greater use of power. Men at the face are a fruitful source of new ideas and they should be encouraged to develop them.

While pushbutton mining is not as easy as it might seem, shaft hoisting is one operation that lends itself to fully automatic operation, said D. E. Renshaw, industry engineering department, Westinghouse Electric Corp., E. Pittsburgh, Pa., in a discussion of automatic hoisting. Describing the automatic hoisting set-up at the new Green Valley and Wabash mines of the Snow Hill Coal Corp., Terre Haute, Ind., Mr. Renshaw pointed out that hoisting is completely automatic from two seams at two levels. The cycle is 61.5 sec, providing a production rate of 700 tph with hoisting distances of 535 and 710 ft.

Many existing hoists also can be made partially automatic. An example is a plan being worked out for a western Pennsylvania mine with a 48-sec cycle for a total hoist of 625 ft. An indicator permits the operator to motor or brake as necessary to compensate for changing skip load. Otherwise, operation is fully automatic. Equipment also is being designed to do the job now done by the hoistman automatically. The hoistman, under such a plan, would be at the bottom and will use pushbut-

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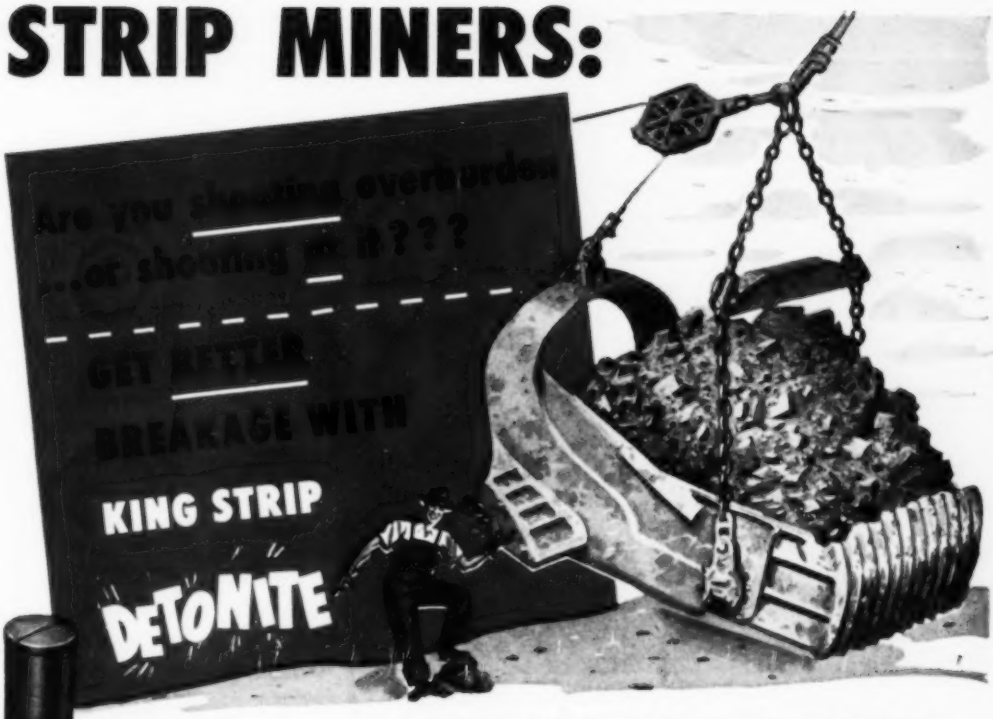

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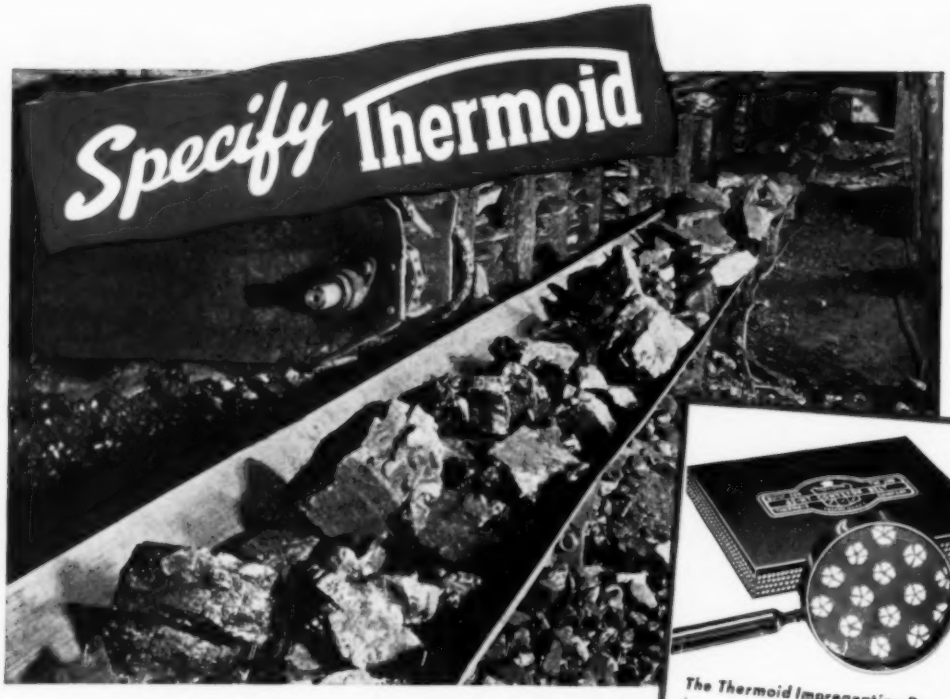

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tons to cage cars, set gates in the tipple and start the hoist, with the automatic equipment handling deceleration and landing of the skip.

In building the new Snow Hill mines, the management decided that under their conditions as much as $35,000 to $40,000 could be spent to keep a man off the payroll, declared A. K. Hert, vice president, in opening the discussion. With the cost for a hoistman totaling $7,000 a year, it was thought that the equipment would pay out in about 10 years. Detailing the cycle of operations, Mr. Hert pointed to the following advantages of automatic control: More coal per hour, very close adjustment of safety devices, less power and reduced manpower. The automatic controls can be readily modified to meet changing conditions, and studies presently are being carried on to achieve further simplification.

The dc drive is ideal for automatic hoist control, said J. A. Setter, General Electric Co., Denver, in further discussion. The problem is more difficult, however, with certain other motor types. Metal mines started using automatic hoists some 35 years ago. Advantages include: less power and sometimes lower power peaks, increased precision and safety, a higher efficiency on certain duty cycles and simplification through direct drive.

Citing some actual experiences, electric shock from induced voltage in trailing cables was analyzed by W. C. Painter, service engineer, Joy Mfg. Co., Denver. "Under certain conditions," Mr. Painter pointed out, "the ground wire in the trailing cable actually creates a hazard of electrical shock. It does this in spite of the fact that the prevention of this danger was the principal reason for its installation in the first place." In dc machines, induced voltage is of a transient nature; in ac equipment, the voltage values can be determined by simple calculation.

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exists between the line and ground. It is not necessary that the machine be operating or even that all three power nips be attached. Consequently, care must be taken by attaching the ground nip to a good ground if possible severe shock from the machine frame is to be avoided.

Since efficient earth grounds sometimes are difficult to get, use of the derived neutral ground with a ground-trip relay was recommended by R. G. Gehlsen, Joy Mfg. Co., St. Louis, Mo., in discussing the problem. Such a system reduces the hazard and protects equipment against damage.

A trackless-mining system for 26-ft pitching coal was the subject of a paper by H. C. Livingston, vice president of operations, The Union Pacific Coal Co., Rock Springs, Wyo., and presented by Mr. Charles. It comprises three phases: development with shaker conveyors, duckbills and a mother belt; room work on the strike with Joy loaders and shuttle cars; and final recovery of the top coal with the same loaders and cars, feeding onto the mother belt over elevating conveyors. Top coal is brought down by cutting and drilling.

The plan provides a continuous operating cycle in entry and room work. Including 20 shifts for moving, the estimate for developing a panel with a nine-man crew averaging 200 tons per shift is 200 shifts. In room work, estimated production with an 18-man crew is 500 tons per shift; top-coal mining, 800 tons per shift. The projected saving is 16c per ton over methods previously employed, with added depreciation on the new equipment bringing it down to a net of 12c. Preliminary experience has indicated that the estimated results will be achieved.

With Mr. Pape presiding, the third technical session opened with a motion picture entitled "Endless Engineering," by the U. S. Rubber Co. and built around the Moffat Coal Co. slope-belt (May *Coal Age*, p. 78). Coal preparation and safety then were covered in panel discussions.

Participants in the panel on coal washing in the Rocky Mountain region were J. D. Price, superintendent, coke ovens, Colorado Fuel & Iron Corp., Pueblo, Colo., and Carl S. Westerberg, executive engineer, Utah Fuel Co., Salt Lake City.

Increasing emphasis on western resources and a rising trend in the demand for western coal for coke and chemicals, among other things, are emphasizing the need for study of preparation practices, Mr. Westerberg reported in leading off the discussion. Citing dwindling petroleum resources as opening up an additional demand for coal in the future, Mr. Price went into the question of reserves in the west, concluding that even if existing estimates were radically reduced an enormous tonnage would still be available.

A recent listing of western coals available, said Mr. Westerberg,

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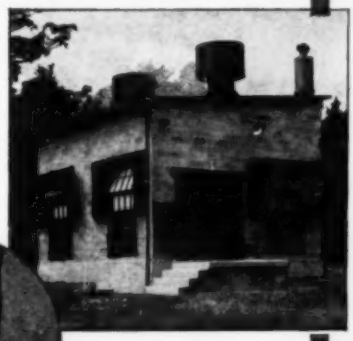

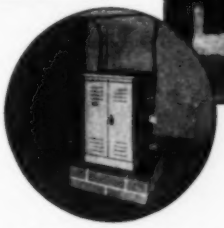

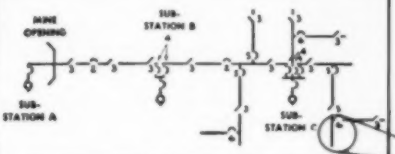

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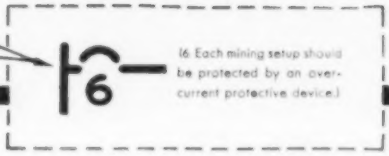
3 A disconnect switch or protective device should be placed at not more than 1,500 ft. intervals in every power line.

4 An overcurrent protective device should be used in each circuit leaving a substation. If automatic reclosing circuit breakers are employed for this, trip-free operating mechanism should be used.

5 An overcurrent protective device should be placed at each main-branch circuit.

6 Each mining setup should be protected by an overcurrent protective device. In some cases, it may be necessary to protect two setups by one device.



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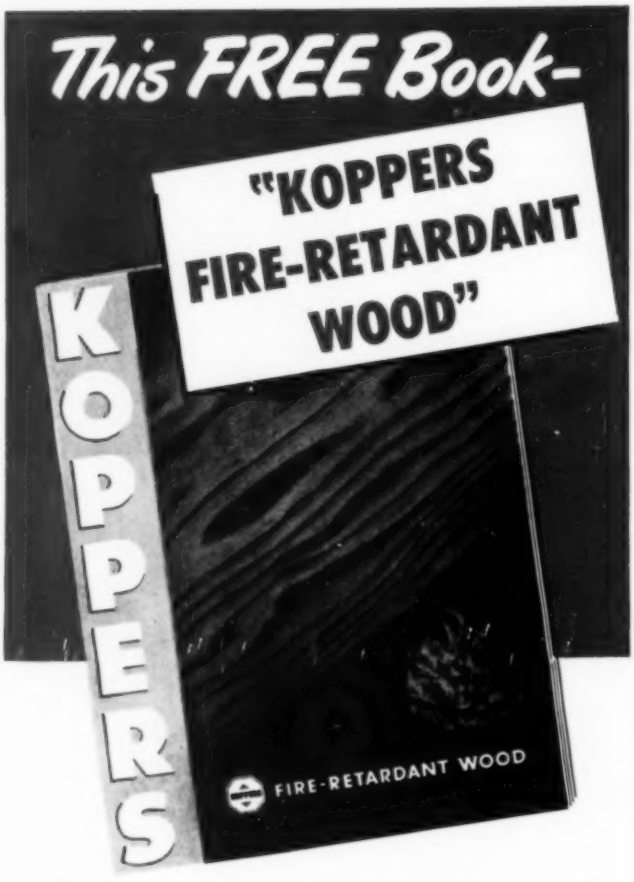

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showed the greatest abundance of High-Volatile A and C and Sub-bituminous A, B and C types. In utilization, careful preparation is required with all high-rank types for maximum market acceptance. If sub-bituminous and lignite types are to be used any distance away, however, certain additional operations, such as drying, are necessary. At present, indications are that it will be possible to do this drying economically, with briquetting a possible additional aid to getting market acceptance.

Preparation, continued Mr. Westerberg, is simple to the extent that a wide variety of tested and proved cleaning units are available, along with drying equipment and screens. Major studies have been made in the recovery of fines. Among other units, the Utah Fuel Co. is experimenting with the V-type Symonds screen—a combination centrifugal dryer and vibrating-screen, which has the advantage of low cost—and the Peterson filter, designed to handle a wider size range. Trained men are becoming more plentiful, leaving the final major problems as finding the money to do the job and finding a market for the production.

What is being done in coal preparation was detailed by Mr. Price to conclude the panel session.

Opening the discussion, Mr. Morrow cited a number of coal-preparation firsts developed in the west and declared that the non-coking coals of the west have the advantage of being easier to handle in making gas and oil. Cost is still high but will be brought down. However, he felt, oil from shale probably will come in ahead of coal. In the cleaning of fine coal, he declared, care must be taken not to spend more than the customer will pay, especially since power plants, in particular, can now be designed to burn almost anything efficiently. Uniformity, however, is vital. High-pressure briquetting equipment offers the possibility of reducing cost by bringing the binder requirements down to around 2%. The rise of heavy media in the east reflects a desire for more-accurate separation with bony coals. The secret of air cleaning is good engineering, not forcing the units and keeping the feed constant. The air table is cheaper to run and has a real place in coal cleaning, while the cost of dust collection, he concluded, is not unreasonable in a well-designed installation.

The west, said Claude P. Heiner, president, Utah Fuel Co., Salt Lake City, probably does not do as much cleaning as it should. Small plants have a difficult problem and possibly the answer is central plants. Commenting on equipment selection, Mr. Heiner said the type of coal is a factor that must be considered, with all wet for coking coal and combination plants for general commercial production in the West.

Widespread misgivings about western coal reserves were reported by George H. Rupp, of C.F. & I., with

Hi-Lift

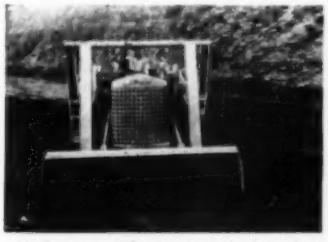
...for low cost!

If you're looking for lower cost stripping, here's the answer . . . an Oliver "Cletrac" crawler tractor and Drott Hi-Lift Shovel.

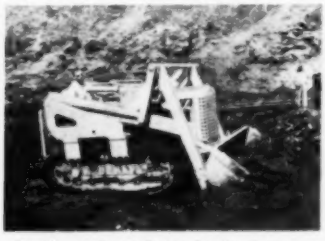
This cost-cutting unit has a wide, deep hydraulically operated bucket that gets a full load every time. The husky power of the Oliver "Cletrac" gives you top crowding action, and the unit bears down and in as it loads. The bucket pivots . . . raising the cutting edge 16 inches . . . on two rugged shoes before lifting, assuring maximum break-out action. The bucket then tilts upward like a shovel for a full bucket every time. Then, the Hi-Lift takes over. The full 10½-foot lift from the ground to hinge pin of bucket makes loading into trucks up to 8½ feet high, fast and easy. Operator always has maximum visibility for fast operation.

Remember, too, with the famous Oliver "Cletrac" design, there is no excess strain on tractor frames or steering mechanism, even with a full loaded bucket, so operating and maintenance costs are exceptionally low.

Your Oliver "Cletrac" Distributor will be happy to give you all the facts.



Plenty of crowding action forces bucket under vein.



Breaking coal out of vein. Loader shoes are making ground contact and 16-inch pivot of cutting edge provides plenty of break-out action.

Hi-Lift makes loading of truck easy. Load may be dumped slowly or in a trip-like action.

Cletrac

a product of

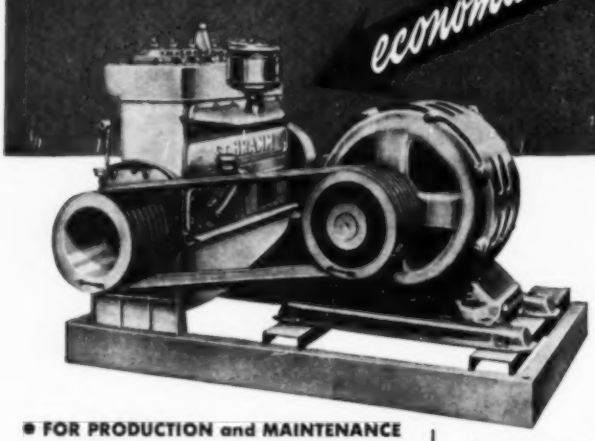
THE OLIVER CORPORATION

Industrial Division, 19300 Euclid Avenue, Cleveland 17, Ohio

A Complete Line of Crawler and Industrial Wheel Tractors

"THE SIGN OF EXTRA SERVICE"

MORE AIR economically!



- **FOR PRODUCTION and MAINTENANCE**
- **FOR SPEEDY PNEUMATIC TOOLS**

SCHRAMM INC. offers a complete line of Industrial Compressors in sizes ranging from . . . 2 to 600 cubic feet displacement . . . Built and designed for continuous heavy duty service with a minimum of attention.

Available in "V" or Flat Belt Drive . . . on base for belt drive from motor or engine . . . or, with direct motor drive. No special foundation required . . . can be bolted to any substantial floor.

Where running water is not available the SCHRAMM Cooling Unit will prove adequate under severest conditions. Accessories essential to any modern industrial installation can also be provided.

Write for Bulletin #4910.

Important Features

- Compact...Easy To Install
- Mechanical Intake Valve
- Force Feed Lubrication
- 100% Water Cooled
- Electric Push Button Starting
- En Bloc Construction
- Easy Accessibility
- Vibrationless
- More Bearing Surface

SCHRAMM INC.

THE COMPRESSOR PEOPLE

WEST CHESTER PENNSYLVANIA

actual test work in certain areas showing only a fraction of present estimates. However, the West need not fear a scarcity but new mining methods should be explored to increase recovery.

Markets are a Wyoming problem, said Mr. Pape, with the big question getting the water out of the coal. It is now thought that it can be done for 25c per ton. If drying can be done without firing and disintegration in shipment, Wyoming low-ash coal can serve a greatly expanded market when it comes.

Responding to a question, Mr. Price described the Rupp-Franz filter used by C.F. & I. as an adaptation of the vibrating filter for dewatering fine coal developed some 10 years ago. With a capacity of 10 to 15 tph, the filter can dewater to within 1 to 2% of the results obtained with vacuum filters.

Concluding the preparation phase of the program, the use of semi-portable heavy-media plants in coal preparation was outlined by Clyde E. Osborn, investigation engineer, Western Machinery Co., San Francisco. Such small prefabricated semi-portable plants, he declared, meet the need for a highly efficient plant with low capital and operating costs.

Describing briefly a number of installations, Mr. Osborn also made the point that such plants are a ready means of supplementing existing preparation facilities because they are immediately available, can be added without interrupting the operation of the existing plant and raise the overall quality of the product by making it possible to be more critical in picking or other preparation by retreating pickings or middlings in the heavy-media equipment.

Safety in mechanical mining was the theme of the symposium concluding the technical sessions. Thomas Allen, Colorado chief coal-mine inspector, was panel chairman, with members as follows: Kirk V. Cammack, U. S. Geological Survey; R. H. Dalrymple, chief inspector for Utah; Lyman Fearn, chief inspector for Wyoming; John A. Garcia, chief inspector for New Mexico; and Eddie Morgan, federal inspection staff.

On whether mechanical mining is safer than older hand mining, Mr. Fearn stated that in Wyoming it apparently had cut accidents two-thirds, while Mr. Garcia said that in the case of two mines in New Mexico, the ratio was around 7:1 in favor of the mechanical operation. Mr. Dalrymple questioned whether a fair comparison is possible, pointing out that if present safety measures had been in effect 30 years ago equally good records probably would have been attained. Mr. Morgan stated that the fair way to compare is on man-hours worked and expressed the opinion that on that basis the improvement would not be too great.

Why mechanical mining is safer—if it is—found general agreement on

DOWNTIME SLASHERS— YARDAGE MAKERS— MONEY SAVERS...

Firestone OFF-THE-HIGHWAY TIRES

The maximum traction tire that keeps pulling for you anywhere on earth.

The tire for free-rolling wheels that gives better flotation and longer life.

IT TAKES a tire that's tougher than rock for quarrying, strip mining, and other severe operations, a tire that will take hold and GO . . . with heaping loads, right over the most treacherous terrain. The ONE tire that will do just that, day in and day out, is the Firestone Rock Grip.

Its thick, tough, "elephant-hide" tread is extremely resistant to cuts and snags. Those rugged power bars in the tread deliver plenty of traction, provide quiet rolling on pavement. The bodies of these tires are fortified to stand up, even under the most unmerciful beating. Their extra-strong, low-stretch, Gum-Dipped rayon cords prevent tire growth and preserve body strength for extra retreading.

Firestone Rock Grips will shorten your downtime, increase your yardage, and broaden your margin of profit.

Listen to the Voice of Firestone every Monday evening over NBC and Americana over NBC Network Television Stations

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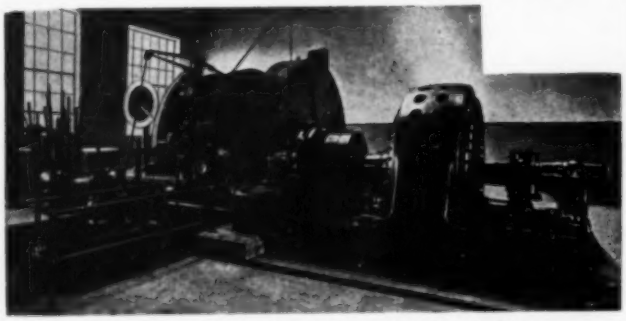
When you buy replacement tires or new equipment SPECIFY

Firestone OFF-THE-HIGHWAY TIRES

Lepley EQUIPMENT for COAL MINES



We have no line of so-called "standard" hoists, but have been building steam and electric shaft and slope hoists for half of a century. Each design is based upon a first-hand study of all the factors, right on the ground.

Hoists

SKIPS
CAGERS
SHEAVES
ROTARY DUMPS
CONVEYORS
ROCK LARRIES
TIPPLES
COKE MACHINERY
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CONNELLSVILLE MFG. & MINE SUPPLY COMPANY
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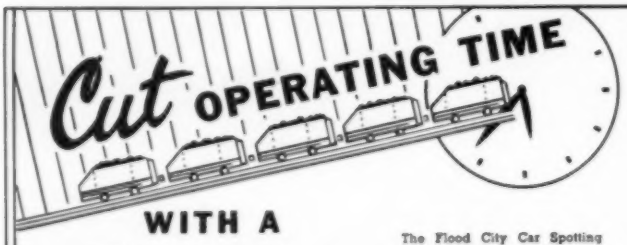
Cut OPERATING TIME



WITH A
Flood City
CAR SPOTTING
HOIST

The Flood City Car Spotting Hoist features a quiet, self-ciling worm gear reducer rated at 6000# rope pull at 35 ft./min. INHERENTLY NON-REVERSIBLE DRIVE holds drum stationary when motor is stopped. ANY STD. MAKE OF MOTOR IS USABLE. Sturdy jaw clutch frees the drum for coupling the trip.

SPECIFICATIONS: Length, 7'; Width, 29½"; Height, 30½"; Weight, 2195 lbs.; Rope Capacity, 500 ft.—⅝", 750 ft.—½". Channel iron frame with solid steel bottom . . . completely guarded . . . all parts readily accessible.

FLOOD CITY BRASS & ELECTRIC CO.
JOHNSTOWN, PA. • BRANCH OFFICE: CHARLESTOWN, W. VA.

better supervision as a major factor, plus better inspection, concentration of operations, trackless haulage, more clearance, less handling of cars and better mining methods. Still better methods are necessary, however, Mr. Allen pointed out, while Mr. Morgan declared that while other things are being improved track frequently is forgotten, thus canceling some of the benefits. Handling big cars with sprags and blocks, which are not suitable, is a source of haulage accidents, Mr. Cammack pointed out.

On the subject of shooting on the shift, the panel agreed that it is safer than old methods of blasting coal.

Face ventilation is better with mechanical mining, declared Mr. Fearn in opening the discussion of this topic. Developing the topic, Mr. Cammack declared that it is a serious mistake to give up blower fans. In general, he declared, the best results can be secured with a combination of blowers and brattice. Discussion from the floor brought both agreement and disagreement from operating men, with emphasis on proper installation and operation if they are used.

On the question of percentage of extraction in mechanical as compared to hand mining, Mr. Fearn stated that in Wyoming extraction with shakers is around 70% and with mobile loaders 80%, compared to approximately 50% with the old hand methods.

Is mechanical pillar mining as safe as hand or can it be made as safe? It is not and cannot be made so, Mr. Dalrymple contended, because machines require more free space and it is difficult to keep timbers up. In addition, it is difficult to maintain a proper break line. Mr. Fearn stated that it can be made just as safe, with Mr. Cammack agreeing and pointing to more-rapid extraction as a further contributing factor.

Maintenance of the mine is less with mechanical mining, the panel agreed, with Mr. Morgan citing full retreat as one change in methods leading to an improvement in general mine ventilation. Multiple heading entries and more air courses was another cited by Mr. Garcia. There was general agreement that supervision and supervisors were better since the advent of mechanical mining.

On the question of new hazards and how they can be controlled, Mr. Morgan pointed out that noise was once considered such but now apparently is no problem. Gas and dust hazards are increased, he declared but are easy to control.

Is the contract or day-wage basis of payment safer? The panel agreed that, day-rate payment resulted in greater safety, largely because the man did not concentrate on loading coal to the exclusion of everything else, including such things as setting timbers for which he received no pay. On the subject of comparative working conditions, the panel agreed that they are far superior with mechanical mining.

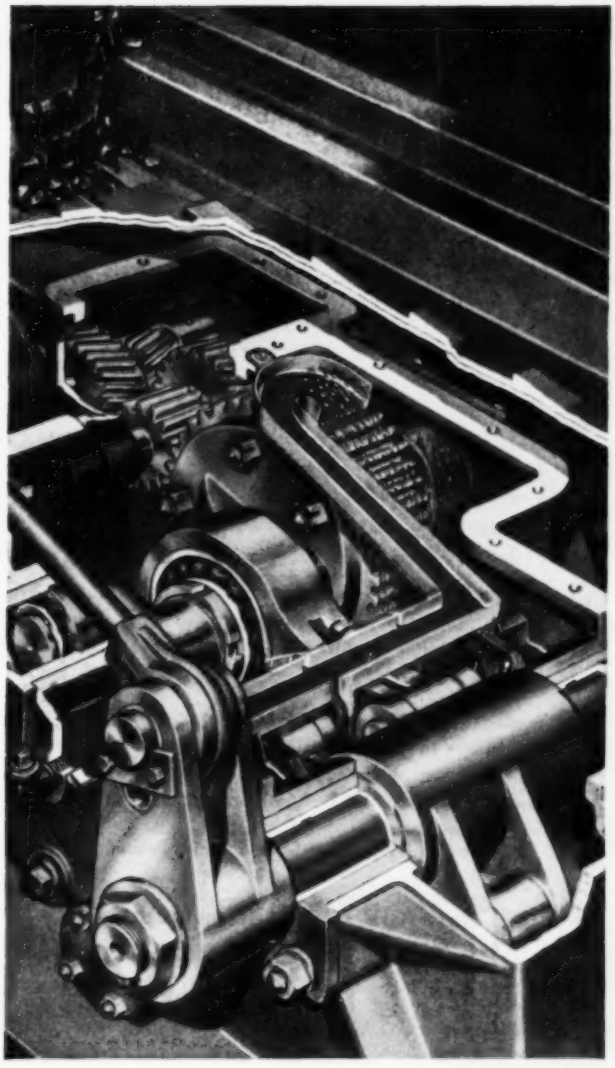
To improve mechanical mining from

Inside Knowledge on Lubrication Problems

—SHOCK LOADS—

This is One of a Series of Messages on Lubrication Problems in Your Plant

Oil Gets a Shake-up Here!



As COAL is moved along this shaker conveyor, the drive gears and bearings are subjected to the shocks resulting from the constant shaking, jerking motion.

It takes an oil that will stand up under continuous shock loads to cushion these vital parts against metal-to-metal contact and wear. At the same time, this oil also must flow freely through the troughs and small openings.

Gargoyle Vactra Oil AA distributes completely throughout the entire mechanism and forms strong wear-resisting films on all rubbing surfaces. It's in use in many mines where it has reduced wear to a minimum and brought important savings in time and repair bills.

See your Socony-Vacuum Representative now and get this proved lubricant in your shaker conveyors.

SOCONY-VACUUM OIL CO., INC. and Affiliates: Magnolia Petroleum Company General Petroleum Corporation

GARGOYLE Lubricants

SOCONY-VACUUM

Socony-Vacuum Correct Lubrication

FOR EVERY MACHINE . . . EVERY OPERATING CONDITION

SuperDuty Highly Efficient in Elimination of Pyritic Sulphur

When elimination of pyritic sulphur from fine coal sizes is a problem, the SuperDuty Diagonal Deck Concentrating Table is established as the most efficient and profitable cleaning equipment available today.

The SuperDuty Diagonal Deck places approximately 75% more working riffles in the natural path of material flow, thus permitting even small differences in specific gravity to respond for speedy elimination of fine ash and pyrite.

Engineers who have checked recent performances are more than enthusiastic. New installations are ranging from single machines to batteries of 20 or more, with one 64 table installation the largest to date.

Your inquiry is invited. Ask for Bulletin 119.

CONCENCO FEED DISTRIBUTOR

The Concenco Revolving Feed Distributor is a heavily fabricated, all steel machine, with motor drive requiring only ¼ H.P. in operation. This distributor effectively provides a splitting of feed into any desired number of equal portions. It is especially suitable for feeding efficiently a battery of coal washing tables.

THE DEISTER ★ CONCENTRATOR COMPANY

903 Glasgow Ave. • Fort Wayne, Ind., U.S.A.

CONCENCO PRODUCTS

★ *The ORIGINAL Deister Company* ★ *Inc. 1906*

the safety standpoint, Mr. Garcia stressed continued research into better methods and continued education of supervisors and men in safety. Better discipline was recommended by Mr. Cammack, who declared that present safety codes and regulations are ample if their provisions are carried out.

The business session concluding the meeting was preceded by the showing of two movies: "Euclids Move the Earth," by the Euclid Road Machinery, and "Indian Paint," the story of steel and rope making, by C. F. & I.

Formation of a committee of state inspectors, to be named by Mr. Allen, chairman for the first year, was approved by the institute to report annually on safety problems and progress and to advise with producers on conditions needing correction. The institute also went on record in opposition to S. 1031, giving federal inspectors mine-closing power, and approved advising the western representatives of its opposition to further attempts by the United Mine Workers to increase the cost of coal and to further contributions to welfare funds unless matched by the miners.

Four life memberships were voted as follows: M. B. Urquhart, Denver; Hugo H. Machin, Boulder, Colo.; B. W. Snodgrass, Denver; and D. H. Pape, Sheridan, Wyo.

Glenn E. Sorenson, general manager, Kemmerer Coal Co., Kemmerer, Wyo., was elected president for the coming year, vice F. W. Koelling, superintendent, Stag Canon Branch, Phelps Dodge Corp., Dawson, N. M. F. W. Whiteside, consulting engineer, Denver, was re-elected secretary-treasurer. Other officers were chosen as follows:

Vice presidents—Colorado, C. E. McWhorter, Goodman Mfg. Co.; New Mexico, John A. Garcia, chief inspector; Utah, Thomas McCourt, superintendent, Kaiser Co., Inc.; Wyoming, Walter Johnson, president, Sheridan-Wyoming Coal Co., Inc.

Executive board—Colorado, Clement Audin Sr., Champion Coal Mining Co., and Walter Bachman, C. S. Card Iron Works; Wyoming, William Wilkes, The Union Pacific Coal Co., and Lyman Fearn, chief inspector; Utah, Wiley W. Wheeler, Lion Coal Corp., and D. F. McElhattan, Mine Safety Appliances Co.; New Mexico, J. R. Kastler, St. Louis, Rocky Mountain & Pacific Co., and Arthur Lorenzo, Stag Canon Branch, Phelps Dodge Corp.

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Careers in Coal Shown to High-School Principals

A bright future for coal-mining engineers was outlined for 18 Illinois high-school principals in a week-long course, June 20-25, at the University of Illinois. The course, sponsored and financed by the university and the coal operators of Illinois, reviewed

DUST-PROOFING AND FREEZE-PROOFING WITH

PERMATREAT COAL SPRAY

Protect **INDUSTRIAL**

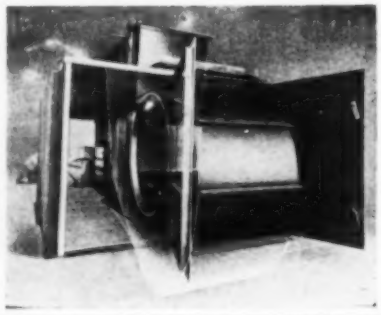
COAL HANDLING EQUIPMENT

Permatreat protects coal handling equipment just as motor oil protects cylinders in an automobile engine. Permatreat eliminates corrosive action which causes breakdowns in stokers and other handling equipment. It eliminates the problem of unloading frozen hopper cars; handling and storage are easier. Permatreat also eliminates the dust nuisance by sealing fly-dust to coal.

An Ashland representative will gladly answer coal spray treating questions of industrial users of coal and coal mine operators. For the complete story of coal spray treating of industrial coals, just drop us a line and ask a representative to call; no obligation.

ASHLAND OIL & REFINING COMPANY
Ashland, Kentucky

Lepley EQUIPMENT for COAL MINES



Reversible, supply or exhaust fans to suit the mine. Sizes up to 35 ft. in dia. by 8 ft. face. Producing 700,000 cu. ft. min. at 10.3 inches water gauge. Wheel travel 100 R.P.M. Driven by steam or electric motor.

Fans

HOISTS
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AND ALLIED EQUIPMENT

CONNELLSVILLE MFG. & MINE SUPPLY COMPANY
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FAMOUS EXAMPLES OF ARMORED CONSTRUCTION

1. THE CIVIL WAR "MONITOR"

Extended, heavy steel side plates protect sheaves
Heavier pins and axles
Tough steel reinforcing straps
Oversize forged steel hook and shackle

2. AMERICAN DIAMOND SHELL BLOCK

9301

Dropped, slammed and battered on the job, blocks and sheaves have to be *tough!* Compare AMERICAN *"armored construction"* . . . see why these blocks and sheaves serve better, last longer. Many types, all sizes, from 1½ to 250 tons, for wire rope only. Sold by distributors everywhere. Made by AMERICAN HOIST AND DERRICK CO., St. Paul 1, Minn.

ALSO MAKERS OF THE AMERICAN HANDIWINCH AND GENUINE CROSBY CLIPS

ASK FOR AMERICAN BLOCKS AND SHEAVES

coal's progress in safety and the use of machinery, predicted further advances and assured the 18 high-school principals who attended that students who entered the industry should share in the benefits of future progress. The success of the course was borne out in numerous requests by the principals that it be repeated in 1950.

Major speakers and their subjects in the course were as follows:

W. H. Voskuil, University of Illinois—"Mineral Economics."

M. D. Cooper, vocational training director, National Coal Association—"The Mining Industry."

G. W. White, University of Illinois—"Mining Geology."

J. L. Hough, University of Illinois—"Petroleum."

E. J. Eckel, University of Illinois—"The Metallurgical Industry."

A. I. Andrews, University of Illinois—"Ceramics."

H. L. Walker, head, Mining and Metallurgical Department, University of Illinois—"Coal-Mining Safety."

W. R. Chedsey, University of Illinois—"Mining Engineering as a Profession."

J. A. Bottomley, Sahara Coal Co.—"Coal and Mineral Preparation."

H. C. Woods, chairman of the board, Sahara Coal Co., and chairman, educational committee, National Coal Association—"The Coal Industry Beckons to Youth."

G. B. Clark, University of Illinois—"The University's Educational Program in Mining Engineering."

Principals attending the course also saw movies of coal mining, toured the university's mineral and metallurgical laboratories, inspected the Small Homes Council and its research houses and visited surface and underground operations at a nearby coal mine.

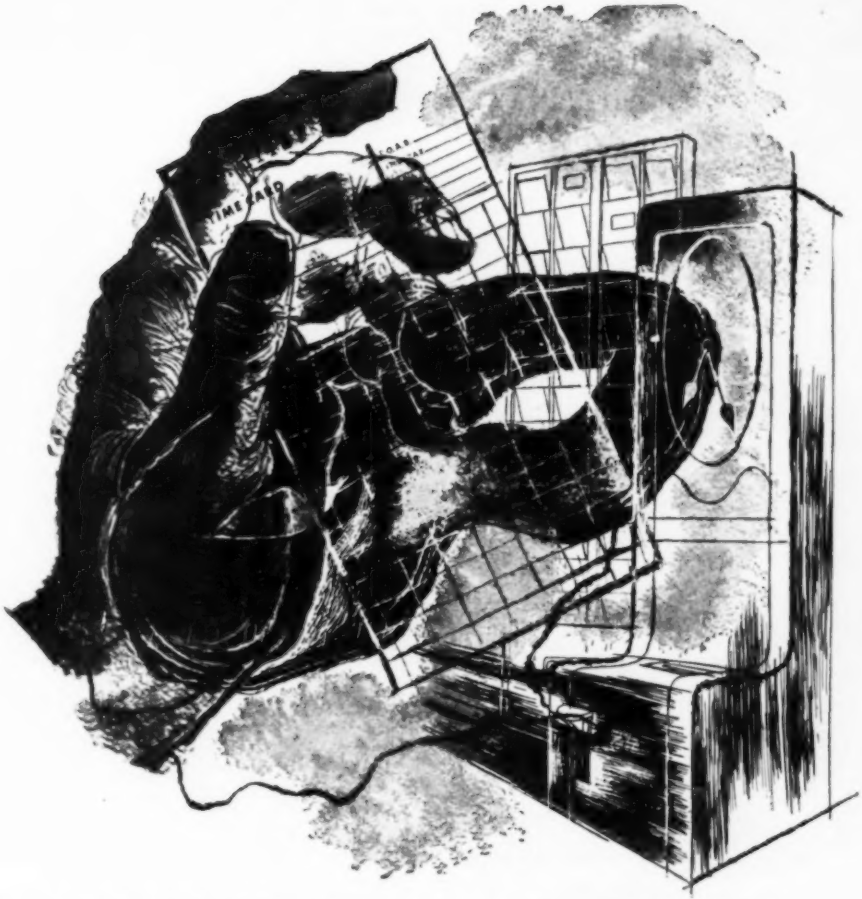
•

Anthracite Institute to Stress Summer Fill-up

The Anthracite Institute will aggressively push "fill-up" in coming weeks with the release of a special "Fill Up Your Bin With Anthracite" advertisements to appear in 65 newspapers in 54 cities, Frank W. Earnest, Jr., president, announced July 11.

"Although the 'fill-up' campaign of the industry has been a success in the general market area to date," Mr. Earnest said, "the importance of continuing fill-up sales cannot be stressed too strongly." Mr. Earnest advised dealers to get across to their customers the fact that last winter was the warmest heating season in 78 years, and a merely normal winter this year will call for laying in fuel now.

"More than ever, the industry needs coal to flow to consumers' bins for 12 months of the year, if the 5,000,000 anthracite homes are going to be kept comfortable during the relatively few months of the heating season. To meet the estimated requirements for



Is this PROFIT THIEF at work in your mines?

He works in hundreds of mines—choking, stifling machines, slowing production, raising maintenance expenses—costing the industry untold sums of money that *can* be saved.

You may not think he's at work in *your* mines, but it will pay you to have a look—the sooner the better.

For example . . . here are some places to look.

Are the grease guns in your mines still being filled by old-time "paddle methods"—wasting time, wasting grease, risking contamination and dirt? You've caught a suspect!

You can save 3¾ man hours for every 100 lbs. of grease and eliminate contamination risks.

Is the "man power cost" of your present lubrication method way out of line? Is it a hit-or-miss method? There's a production thief!

There is a way to save up to 23.9 man hours in applying each 100 lbs. of grease.

What about production losses from time-out-for-lubrication? What about repair and replacement costs for parts that failed? More thievery!

You can lubricate hundreds of bearings from one central point, with the right grease in the correct amount—while the machine continues to produce!

Got an idea there may be a "profit thief" in *your* mines—in the guise of faulty and costly old-time lubrication methods?

There's one proven way to stop this loss.

An Alemite representative can tell you in 10 minutes how Alemite Methods will simplify and better organize your lubrication procedures. He can show you how mechanized lubrication from barrel-to-bearing will increase your coal tonnage and profits.

Use the phone. Call your Alemite Distributor. Or write to Alemite, 1838 Diversey Parkway, Chicago 14, Illinois.

ALEMITE

MODERN LUBRICATION METHODS THAT CUT PRODUCTION COSTS

STEWART WARNER

Your Guarantee of Quality and Service

MESCO Products

A Complete Line of Track and Trolley Products for the Mining Industry

Mosebach Electric & Supply Co.
1115 Arlington Avenue Pittsburgh 3, Pa.
HEmlock 8332

Coal and Business Activity

		1949 to This Date	1949 Over 1948, to Date
Est. anthracite prod., week ending July 9	848,000	21,413,000	—26.9%
Est. bituminous prod., week ending July 9	4,885,000	260,868,000	—12.4%

Source: U. S. Bureau of Mines.

	Bituminous Coal Stocks (Thousands, net tons)				Consumption (Thousands, net tons)		
	June 1, 1949	Days' Supply	May 1, 1949	June 1, 1948	May, 1949	April, 1949	May, 1948
Electric power utilities	23,444	128	23,499	14,601	6,142	6,330	7,112
By-product coke ovens	13,870	59	12,914	7,762	8,305	8,253	8,185
Beehive coke ovens	†	†	†	†	845	995	912
Steel and rolling mills	1,351	67	1,160	1,074	623	714	822
Cement mills	1,433	66	1,105	1,001	670	649	692
Other industrials	16,465	70	15,092	14,034	7,263	8,301	7,146
Railroads (Class I)	9,701	31	9,296	7,208	5,892	6,121	7,766
Retail dealers	2,482	15	2,098	1,352	5,046‡	6,131‡	5,628†
Total	72,746	65	65,164	47,032	34,786	37,494	38,263

Source: U. S. Bureau of Mines. †Not available. ‡Retail dealer deliveries.

	Latest Week*	Month Ago	Year Ago
Business Week Index of Business Activity, wk. ending July 16	178.5	181.9	194.0
Steel ingot operations (% of capacity)	78.3	84.4	93.1
Electric power output (million, kw-hr)	5,342	5,373	5,197
Crude oil production (daily avg., 1,000 bbl)	4,671	4,868	5,444
Misc. & L.C.L. carloadings (daily avg., 1,000 cars)	69	72	81
All other carloadings (daily avg., 1,000 cars)	55	63	66
Prices, spot commodity index (Moody's, Dec. 31, 1931 = 100)	341.7	338.4	431.2
Prices, industrial raw materials (B.L.S., Aug., 1939 = 100)	212.2	210.6	275.6
Prices, domestic farm products (B.L.S., Aug., 1939 = 100)	299.0	293.7	382.9
Prices, finished steel composite (*Iron Age*, lb)	3.705c	3.705c	3.211c
90 stocks, price index (Standard & Poor's Corp.)	117.9	111.0	127.9

*Date of latest week for each series on request.

48,000,000 tons for 1949-50 coal year, 4,300,000 tons will have to be produced during every remaining month, and especially this summer. This is top industry production capacity and only a successful fill-up job can assure it."

In addition to stressing "fill-up" in advertising, the Anthracite Institute has supplied 200 newspapers throughout the market area with dealer tie-in mats, so that every retailer can push the fill-up campaign in his own local area by the simple process of contacting the newspapers. Also Institute sales aids in the form of "fill-up" folders for promotion to consumers are available on request.

Producing companies individually and through the Anthracite Institute are backing dealers this year with "fill-up" promotion that will total hundreds of thousands of dollars, it was pointed out.

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Association Activities

Pennsylvania Anthracite Section, A. I. M. E., at its annual meeting held at Lake Harmony, Pa., June 29, elected new officers as follows: Chairman, George A. Roos, Philadelphia & Reading Coal & Iron Co., Pottsville; vice chairman, Henry A. Dierks, Glen Alden Coal Co., Wilkes-Barre; and secretary-treasurer, Floyd S. Sanders, Goodman Mfg. Co., Wilkes-Barre. John Milton Humphrey, Jr., Lehigh Valley Coal Co., Wilkes-Barre, was elected a member of the executive committee for a two-year period, and the following were elected executive-committee members for three years: W. Julian Parton, Lehigh Navigation

MINE & INDUSTRIAL DIAMOND Supplies

Sales and Service on these
GENERAL LINE MINE SUPPLIES

Acker Core Drills
American Steel & Wire Cable
Austin Powder Co.
Atlas Lathes & Drill Presses
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DIAMOND SUPPLY COMPANY, INC.
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replacements are far less frequent when you use

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"HERCULES"

REG. U.S. PAT. OFF.

RED-STRAND

WIRE ROPE

because—

Its strength... its toughness... its unusual endurance—add up to longer wire rope life

These essential life factors are not a matter of chance. They are the result of combining "HERCULES" quality and PREFORMING. This is a winning combination as Preforming is the process that increases the life of a wire rope, by freeing it of internal stresses. It also makes a wire rope easier, quicker and safer to handle.

"HERCULES" RED-STRAND the DEPENDABLE WIRE ROPE for any TOUGH JOB

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A. LESCHEN & SONS ROPE CO.

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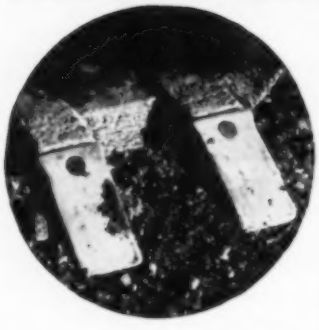
FOR HARD FACING AND REPAIR

Amsco WELDING PRODUCTS



Amsco No. 459

Increases life 2 to 5 times for dippers, pug mill knives, brick dies, shredder knives, drag chain links, pulverizer hammers, sand pumps and similar parts. Amsco No. 459 is centrifugally cast . . . resists softening up to 800° F. . . . and has a Brinell hardness of 500-600. No. 459 produces a chrome-moly martensitic iron deposit and is designed for severe abrasion service with moderate impact conditions.

The application above shows Amsco No. 459 applied to the front and teeth of a manganese steel walking dragline bucket, used for stripping overburden from iron ore at a Minnesota mine. In similar applications where more severe impact coupled with abrasion is encountered, Amsco Economy Hardface is recommended.

Ask for free reprint of Hard Surfacing by Fusion Welding

Brake Shoe
AMERICAN MANGANESE STEEL DIVISION

409 E. 14th St., Chicago Heights, Illinois
Offices in Principal Cities

Coal Co., Lansford; Edward Fox, Philadelphia & Reading Coal & Iron Co., Pottsville; Edmund L. Dana, E. I. duPont de Nemours & Co., Scranton; Carroll A. Garner, Jeddo-Highland Coal Co., Jeddo; and John Moffat Reid, The Hudson Coal Co., Scranton. The meeting was attended by more than 250 members and guests. Honorary guests were Dr. L. H. Young, Institute president, and Mrs. Young, and E. H. Robie, Institute secretary, and Mrs. Robie.

National Coal Association has named a special committee on natural resources to study the problems confronting the industry in connection with the loss of tonnages resulting from competition of other natural resources. H. B. Baird, vice president, Coal Division, Eastern Gas & Fuel Associates, New York, is chairman, and other members are: Rolla D. Campbell, general counsel, Island Creek Coal Co., Huntington, W. Va.; A. B. Crichton, president, Johnstown Coal & Coke Co., Johnstown, Pa.; George H. Love, president, Pittsburgh Consolidation Coal Co., Pittsburgh; George A. Miller, vice president, Peabody Coal Co., Chicago; W. H. Naylor, vice president, Davis Coal & Coke Co., Baltimore; and K. A. Spencer, president, Pittsburg & Midway Coal Mining Co., Kansas City, Mo.

Illinois Coal Strippers' Association has appointed A. J. Christiansen secretary-treasurer, succeeding the late James W. Bristow.

Virginia Coal Operators' Association, at its 30th annual meeting July 14 at the Lonesome Pine Country Club, Norton, Va., re-elected its officers, as follows: George H. Esser, president, secretary and treasurer; H. W. Meador, vice president; E. H. Robinson, assistant secretary-treasurer; E. P. Humphrey and C. F. Connelly, directors, Southern Coal Producers' Association; and E. P. Humphrey, national councillor to the U. S. Chamber of Commerce. Re-elected directors were J. P. Horne, J. P. Shockley, E. P. Litton, R. S. Graham, C. B. Jackson, Jr., A. R. Matthews, Messrs. Connelly, Meador and Esser. Speakers at the luncheon following the business meeting in the forenoon included H. B. Lammers, chairman and director of engineering, Coal Producers' Committee for Smoke Abatement, and James W. Haley, secretary and general counsel, NCA.

Utah Coal Operators' Association at a recent meeting elected the following officers: President, S. J. Craighead, vice president and general manager, United States Fuel Co.; vice president, L. R. Weber, president, Liberty Fuel Co.; and executive secretary, B. P. Manley. Named to the board of directors, in addition to Messrs. Craighead and Weber, were: E. S. O'Connor, vice president, Hi-Heat Coal Co.; Walter F. Clarke, general manager, Independent Coal & Coke

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Want proof that B-Z Round-Rod Screens pay you handsome profits by lasting many times longer? Typical cases show B-Z precision-welded stainless steel screens last as much as 30 times longer than ordinary screens — serve as long as 6 years on the roughest, toughest jobs.

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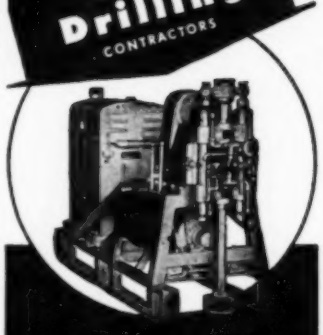


Testing mineral properties with our light gasoline drills. SATISFACTORY COAL CORES GUARANTEED. Ground solidification by our pre-pressure grouting method for shafts. Wet mine areas, horizontal holes for drainage. Electric drills for inside mine drilling.

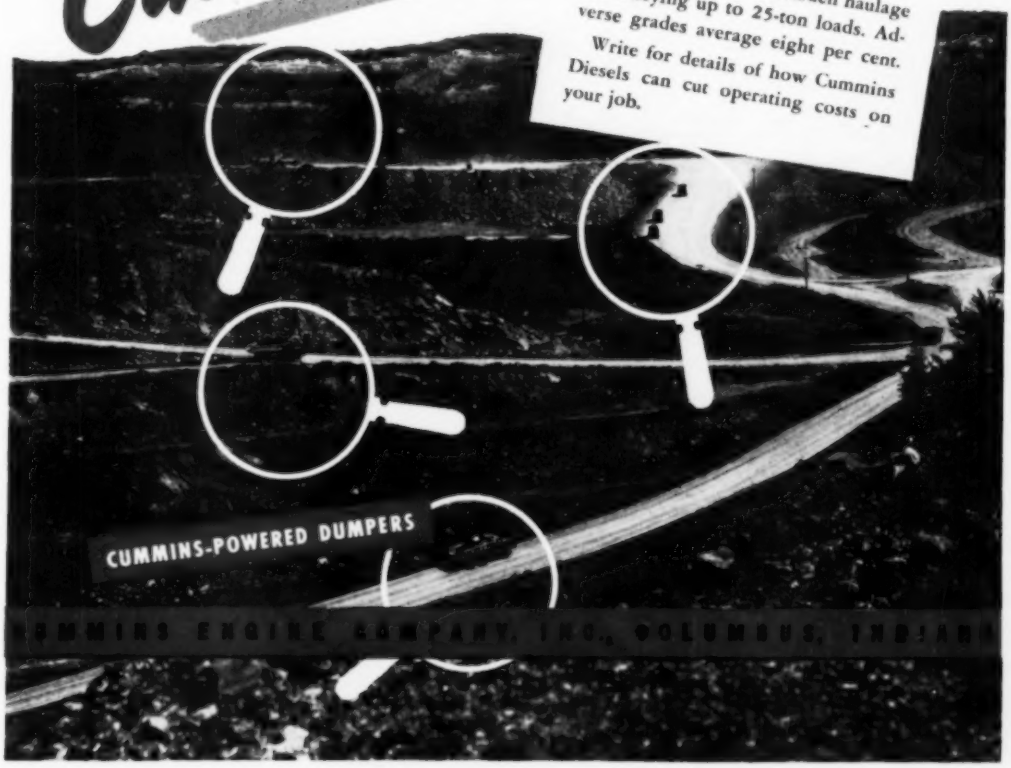
MOTT CORE DRILLING CO.
HUNTINGTON • WEST VIRGINIA

Solved by CUMMINS

In Pennsylvania's Panther Creek Valley, 38 Cummins Diesels powering FCSW64 Mack dumpers are playing a major role in solving the puzzle of successfully recovering coal from a deposit which had once been considered unworkable at a profit.

Hauling from a pit that will reach a 700-foot depth to a dump that will reach a height of 250 feet, the Cummins-Powered Mack dumpers used by Carey, Baxter, Kennedy, Inc., on the Lehigh Navigation Coal Company, Inc., coal stripping job are working 21 hours a day month after month. Typical of the work performed on this job, 34 Cummins-Powered Mack dumpers used on overburden haulage are carrying up to 25-ton loads. Adverse grades average eight per cent.

Write for details of how Cummins Diesels can cut operating costs on your job.

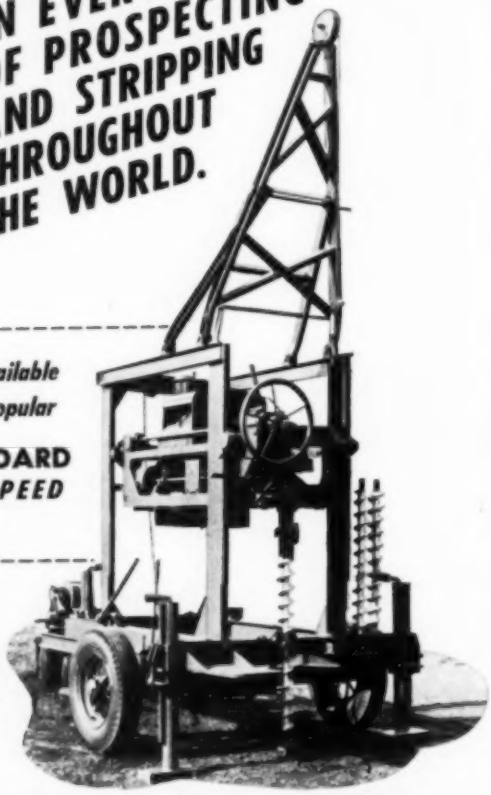


8 YEARS DEVELOPMENT

ON FIELD TESTS IN EVERY TYPE OF PROSPECTING AND STRIPPING THROUGHOUT THE WORLD.

Also Available in the popular

STANDARD *ONE-SPEED* **DRILL**



The Parmanco Two-Speed Transmission Drill is designed to meet the requirements of the general prospecting field where it is not necessary to drill in solid limestone. Special sliding frame permits drilling and pulling of augers without moving drill. New design of chuck eliminates all hand operation in raising power plant. Recommended for 50 to 60 feet with four and one-quarter to four and one-half inch equipment. Under favorable conditions it is being used to greater depths and can be used with six-inch equipment.

PARIS MANUFACTURING COMPANY

PARIS, ILLINOIS

Co.; A. B. Foulger, general manager, Lion Coal Co.; Paul L. Shields, president, Spring Canyon Coal Co.; and Claude P. Heiner, president, Utah Fuel Co.

Colorado & New Mexico Coal Operators' Association, at its annual meeting in June, elected new officers, as follows: President, J. S. Besser, Colorado Fuel & Iron Corp., Denver; vice president, G. R. Harris, Hayden Coal Co., Denver; second vice president, J. R. Kastler, St. Louis, Rocky Mountain & Pacific Co., Raton, N. M.; and secretary-treasurer, O. F. Bridwell.

Southwestern Interstate Coal Operators' Association, at its annual meeting in Pittsburg, Kan., June 27, elected George E. Nettels, Pittsburg, president; Thomas Quinn, Pittsburg, vice president; L. E. Compton, Pittsburg, secretary-treasurer; and Raymond L. Letton, commissioner. Directors elected were: Fred Bowen, W. G. Parrott, George K. Mackie, Jr., H. H. Spencer, Joe F. Kalner Jr., and Harold Compton.

Stoker Manufacturers' Association, at its annual meeting June 13-14, elected new officers, as follows: President, Claude A. Potts, U. S. Machine Corp., Lebanon, Ind.; vice president, C. T. Burg, Iron Fireman Mfg. Co., Cleveland; secretary-treasurer, C. P. Meredith, Steel Products Engineering Co., Springfield, Ohio; and executive secretary, Marc G. Bluth. Named members of the board of directors, in addition to the elected officers, were: Edward M. Clifford, Anchor Division, Stratton & Terstegge Co., New Albany, Ind.; L. C. Dubs, Canton Stoker Corp., Canton Ohio; George W. Graham, Eddy Stoker Corp., Chicago; Frank Hoke, Holcombe & Hoke Mfg. Co., Indianapolis; J. M. McClintock, Illinois Iron & Bolt Co., Chicago; and Walter Sormane, Conco Engineering Works, Mendota, Ill.

Preparation Facilities

Belle Valley Coal Co., Belleville, Ill.—Contract closed with Western Machinery Co. for No. 3-C WKE (HMS) Mobil-Mill to treat 3½-in x 10-M coal; capacity, 50 tph.

Evan-Jones Coal Co., Jonesville, Alaska—Contract closed with Western Machinery Co. for No. 3-C WKE (HMS) Mobil-Mill to treat 3¼x¼-in coal; capacity, 50 tph.

Tennessee Coal, Iron & R.R. Co., Concord mine, Ensley, Ala.—Contract closed with Deister Concentrator Co. for an additional 16 SuperDuty Diagonal-Deck No. 7 coal washing tables to treat ¼x0-in coal.

Franklin-Hydrotator Coal Co., Ravine, Pa.—Contract closed with Wilmot Engineering Co. for one 2½-

SLASH COAL STRIPPING COSTS with MARIONS

THE MARION LINE

Shovels • Draglines • Clamshells • Cranes • Walking Draglines • Pull Shovels

TYPE	CAPACITY
33-M	¾ cu. yd.
362	1½ cu. yds.
372	1¾ cu. yds.
*93-M	2½-3 cu yds.
492	3 cu. yds.
*111-M	3½-4 cu. yds.

TYPE	CAPACITY
4161	5 cu. yds.
151-M	6½ cu. yds.
5323	18 cu. yds.
5561	45 cu. yds.
**7200 Walker	5-7 cu. yds.
**7400 Walker	8-12 cu. yds.
**7800 Walker	15-30 cu. yds.

*Diesel Clutch type and Ward-Leonard electric. **Size of bucket depends on length of boom.

Sizes from 3/4 Cu. Yd. to 45 Cu. Yds.

MARION

POWER SHOVEL COMPANY

MARION, OHIO, U. S. A.

Offices and Warehouses in all Principal Cities

You can depend on "EUCS" for

MORE PROFIT IN EVERY PAYLOAD!

Model FD Rear-Dump being loaded with 15 tons of bauxite in Arkansas.

Dumping 22 tons of iron ore into the crusher on the Minnesota Iron Range—Model TD Euclid.

A 6-yard shovel loading 30 tons of heavy excavation into a Model LD in a Pennsylvania anthracite pit.

● Rear-Dump Euclids are designed and built to move rock, coal, ore and overburden and other heavy excavation at the lowest cost. Easy loading ... large capacity ... speed on the haul road and dump ... long life in heavy duty service ... these are some of the Euclid features that mean more pay in every payload.

There are models for every off-the-highway hauling requirement. Some of the variations in models that are available include five or ten speed transmissions ... semi-rigid or spring mounted drive axles ... manual or hydraulic booster steering ... standard or quarry type body.

Excellent parts and service facilities of a world-wide distributor organization are quickly available ... assure prompt, efficient service when needed. For full information on the Euclid line of earth moving equipment call or write today.

The EUCLID ROAD MACHINERY Co. Cleveland 17, Ohio

EUCLIDS *Move the Earth*

ft-diameter Hydrotator for handling barley coal; feed capacity, 15 tph.

Pine Hill Smokeless Co., Garrett, Pa.—Contract closed with Jeffrey Mfg. Co. for unit washer; capacity 60 tph, 5x¼-in coal.

Pandora Coal Mining Corp., Pandora mine, Dugger, Ind.—Contract closed with Deister Concentrator Co. for four SuperDuty Diagonal-Deck coal-washing tables, two to clean 1¼x¼ and two to clean ¼x0.

Semet-Solvay Division, Tralee mine, Tralee, W. Va.—Contract closed with Deister Concentrator Co. for one additional Type 108-B Concenco revolving feed distributor.

Central Appalachian Coal Co., Morris Creek mine—Contract closed by Roberts & Schaefer Co. with Jeffrey Mfg. Co. for Baum jig; capacity, 300 tph, 5x¼-in coal.

New River Co., Oakwood mine, Carlisle, W. Va.—Contract closed by Kanawha Mfg. Co. with Jeffrey Mfg. Co. for Jeffrey washing plant; capacity, 250 tph, run-of-mine.

Glenn Brooke Coal Co., Charleston, W. Va.—Contract closed by Weirton Construction Co. with Jeffrey Mfg. Co. for Jeffrey washing plant; capacity, 250 tph, run-of-mine.

General Dredging Co., Bloomsburg, Pa.—Contract closed with Deister Concentrator Co. for one No. 7 SuperDuty Diagonal-Deck coal-washing table for cleaning anthracite barley.

Maurer Coal Sales Co., Shamokin, Pa.—Contract closed with Wilmot Engineering Co. for one Type D jig to prepare nut coal; feed capacity, 20 tph.

Oak Coal Yard, Shamokin, Pa.—Contract closed with Wilmot Engineering Co. for one Type A jig to prepare nut coal; feed capacity, 15 tph.

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Foreign Developments

FRANCE—Release of 27 billion francs (about $108 million) from France's counterpart fund for investment and reconstruction programs for the month of July has been announced by the ECA. Of this amount, five billion francs reportedly will be used to increase and improve production in French coal mines to support certain

ROOF SUSPENSION BOLTS

SAFE

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Increase safety and cut costs by holding your roof with West Virginia Roof Suspension Bolts. Easy to install, requiring no maintenance, roof bolts eliminate timbering, prevent any flexure of the individual over-lying layers. Result is a passageway clear from wall to wall, floor to roof, providing less resistance to the flow of ventilating air, enabling loading machines to clean up a cut from rib to rib without interference from timber or timber legs. West Virginia Roof Bolts can be used singly at selected points or in sets of three or four with steel channel. Recommended by the Bureau of Mines. Available in lengths from 2 to 6 feet, in types as illustrated.

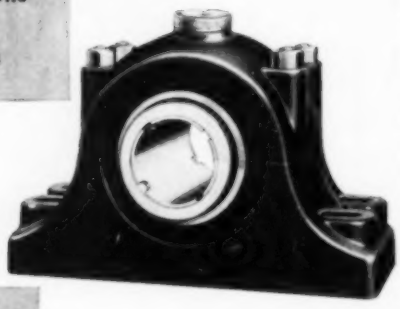
Write for descriptive literature and information on application of roof bolting to your particular problem.

Manufacturers of RAILS and ACCESSORIES TRACK WORK STEEL TIES

West Virginia Steel & Manufacturing Co.

Huntington, West Virginia

Quality-proved by use on millions of industry's toughest jobs



Mounted, sealed, housed, fully assembled, ready to lock on the shaft

Delivered from stock in 4 basic types and a vast range of sizes

"DODGE-TIMKEN" MEANS QUALITY!

100-TON PULL

Three Dodge-Timken Pillow Blocks carry the load of a 100-ton pull of castings in and out of a shot blast chamber for the Falk Corporation, at Milwaukee. The bearings save the gear reducer from side pull and allow the shaft to turn easily even while taking the full load. Perfect operation for 8 years to date.

It was Dodge who took the famous Timken Bearing, mounted it, sealed it, housed it and delivered a pillow block of new high quality—fully assembled, ready to lock on the shaft and carry the power loads of industry with new efficiency.

Power savings, improved machine operation, reduced maintenance, elimination of spoilage and steadier production—all result so regularly from the application of Dodge-Timken Bearings that this great line is widely accepted as the standard for comparison in up-to-date power transmission layouts.

Ask the Transmissioneer, your local Dodge Distributor, how these bearings and other Dodge "firsts" can help you achieve better, more economical production.

DODGE MANUFACTURING CORPORATION, MISHAWAKA, IND.

OTHER DODGE "FIRSTS"

TAPER-LOCK V-BELT SHEAVES. Easy on—easy off—hold fast to shaft.

ROLLING GRIP CLUTCH. No toggles! Flexibility. Positive drive.

"SC" BALL BEARING Pillow Block with new Neoprene metallic-backed seal.

DODGE of Mishawaka, Ind.

CALL THE TRANSMISSIONEER. Look for the name of the Transmissioneer, your local Dodge distributor, under "Power Transmission Equipment" in your classified telephone directory.

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS

subsidiary industries and to finance construction of workers' homes in certain mining areas where inadequate housing has impeded recruitment of labor.

DOMINICAN REPUBLIC—A series of geological surveys designed to increase the production of minerals and chemicals in the Dominican Republic has revealed potentially valuable sources of coal, nickel, iron and gold, according to announcement by the Dominican Information Center, New York. Surveys are now being conducted under the direction of the Dominican Bureau of Mines to determine whether the coal deposits can be profitably mined.

AUSTRALIA—A strike by the nation's 24,000 coal miners begun June 27 in the midst of the country's winter had by mid-July thrown more than 700,000 workers out of jobs and was threatening a complete paralysis of the economy. The miners' union, which is reportedly Communist-dominated, is demanding immediate action on its request for a 15 per cent wage increase, amounting to approximately $4.80 weekly, and a reduction in working hours from 40 to 35 a week. The government insists that the demands be arbitrated by the Coal Industry Tribunal. On July 12 the government's labor minister charged that the strike had been "cooked up in Moscow," and it was reported that the labor government was preparing sedition or conspiracy charges against the Communist party for fomenting the strike. Possibilities for settlement of the strike were further complicated July 11, when the president and secretary of the miners' union were sentenced to a year's imprisonment for contempt of court in refusing to return union funds withdrawn from its bank during passage of emergency legislation prohibiting use of union monies for strike purposes. The miners' federation also was fined about $6,400. Meanwhile, light and gas supplies had been cut and only the most essential public services were being maintained. It was predicted that more than 1,000,000 would be jobless if the strike continued through July.

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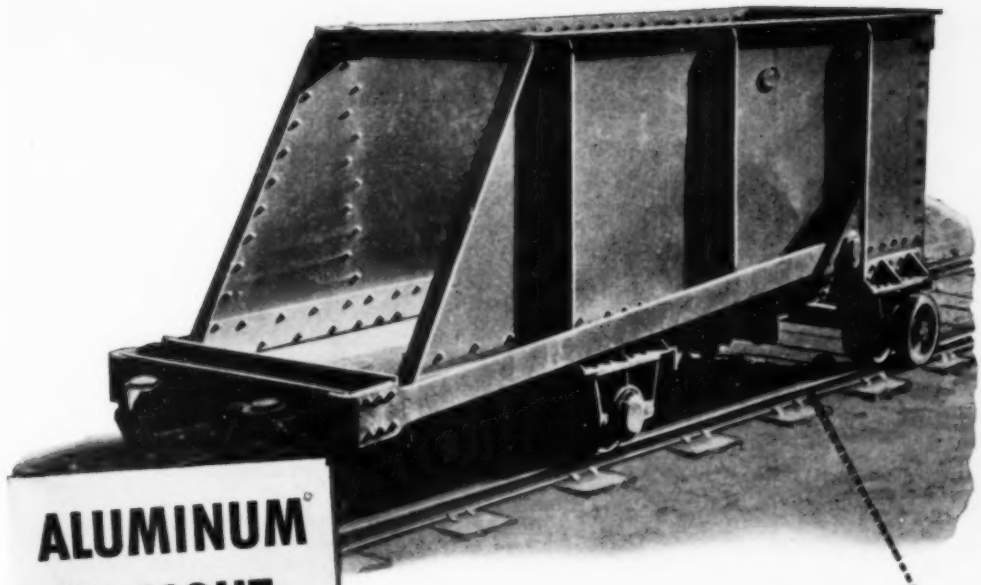
Booklet Shows How to Plan Homes for Coal Use

Location of the coal bin and the ash-removal route close to the driveway and placement of burning equipment next to the cold-storage space to make coal a more convenient household fuel are urged in a new 12-page pamphlet just issued by the Small Homes Council, University of Illinois, Urbana, Ill.

The product of three years of study by Rudard A. Jones, research associate professor of architecture at the university, the booklet tells how home builders can plan in advance for easy fuel and ash handling. The booklet



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ALUMINUM IS STRONG

These facts help gunboats work harder... last longer

An aluminum gunboat weighs half as much as a steel one. Easier hauling? Yes, and easier maintenance, too. Dents are easily bumped out without heating. You paint less because aluminum resists corrosion. And for the same reason, Alcoa Aluminum cars dump cleaner... leave no heel of coal and rock in the bottom corners.

That's why alert operators like Indian Head Collieries are ordering more aluminum gunboats. Whether you buy or build mine equipment, you should have the free book "Alcoa Aluminum and Its Alloys". Write ALUMINUM COMPANY OF AMERICA, 1763-H Gulf Bldg., Pittsburgh 19, Pennsylvania. Or ask your local Alcoa sales office.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM ®

INGOT • SHEET & PLATE • SHAPES, ROLLED & EXTRUDED • WIRE • ROD • BAR • TUBING • PIPE • SAND, DIE & PERMANENT MOLD CASTINGS • FORGINGS • IMPACT EXTRUSIONS
ELECTRICAL CONDUCTORS • SCREW MACHINE PRODUCTS • FABRICATED PRODUCTS • FASTENERS • FOIL • ALUMINUM PIGMENTS • MAGNESIUM PRODUCTS

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BAKER

FOR THE MAN SIZE JOBS

It is significant that today on the BIG TOUGH JOBS you'll find Baker Bulldozers and the A-C HD-19 in the key spots . . . where the going is toughest, where big yardages must be moved fast and at lowest cost.

And it's not the color of the paint that makes Baker the favorite — it's the reputation they've been building up among experienced users — for out-dozing anything in the field — for more yardage per pass — for easier operation — for rugged dependability.

These are facts that can be proved in the field, on your job. If you are still using your regular bulldozers, it will pay you to investigate this great, new Baker. See your friendly Baker Allis-Chalmers dealer today.

BAKER MFG. CO.
Springfield, Illinois

BAKER

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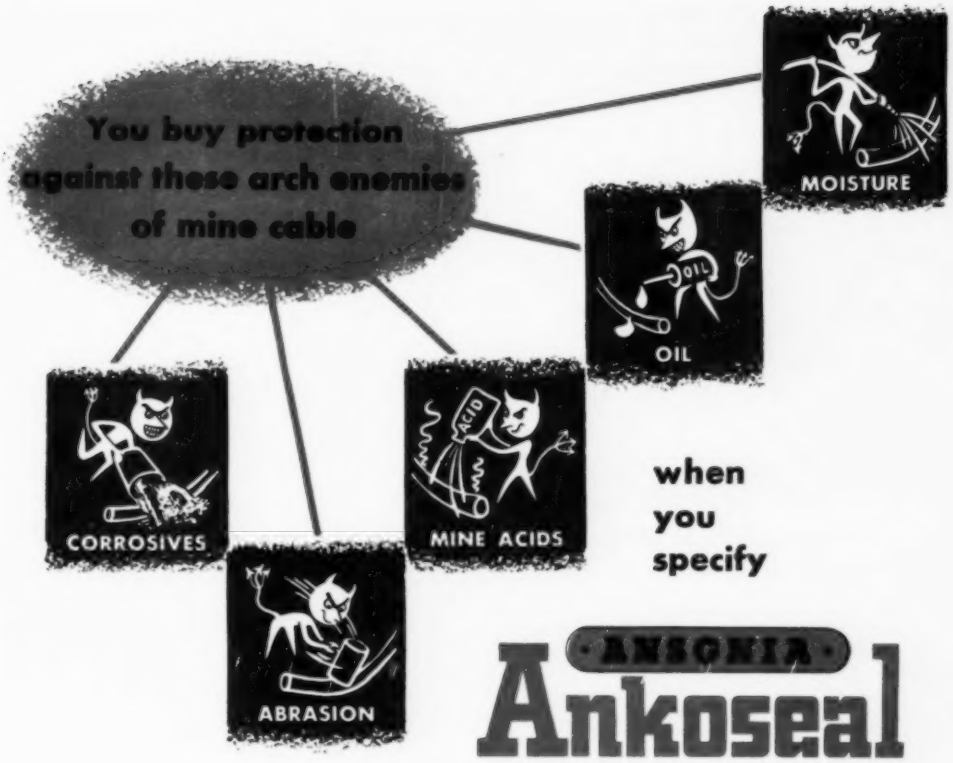

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ANSONIA Ankoseal

By providing a combination of physical toughness and chemical inertness, Ansonia Ankoseal Cable has exceptionally high resistance to the elements which are so destructive to the old style cables. Besides the obvious advantages of its longer service life, Ansonia Ankoseal brings impressive weight saving to the mining operation whether the cable be for power or telephone use. For example, a comparison you can make for yourself using 26 pair—No. 22 will show Ansonia Ankoseal saving 20% over rubber plus neoprene, and as much as 50% over paper and lead cable. If you haven't the full story of what Ansonia Ankoseal can do for you, please write us for more information.

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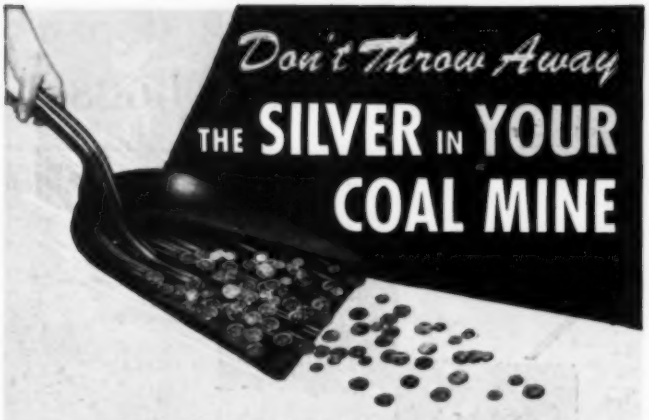

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SAVE UP TO 25¢ PER TON WITH

OSMOSE

TREATED MINE TIMBERS

The timbers in your mine represent plenty of "silver" when you consider that this one item represents 40% to 60% of your supply bill. If you let timbers ROT, you might just as well throw away a shovelful of your hard earned profits every day in the week. We can cut your maintenance cost by making mine timbers LAST LONGER. You save on timber! You save on replacement! With Osmose you can make ANY wood species, even beech, gum, hickory, ash, elm and maple, into long lasting timbers.

1 **We can furnish you with OSMOSE TREATED TIMBER**

We can supply you with Osmose-treated square-sawed, slabbed or round timbers, ties, collars, posts, lagging, caps, wedges or tipple timbers from one of our treating plants. These select OSMOSE-treated timbers will render many years of EXTRA service.

2 **We will CUSTOM-TREAT TIMBERS furnished by you**

We will OSMOSE-treat your own timber at our nearest treating plant. Remember, this treatment can be applied to ANY wood species, even beech, gum, hickory, ash, elm and maple.

3 **We will furnish MATERIALS and YOU can treat your own timber**

By constructing an inexpensive vat and following directions, you can treat your own green timber with OSMOSALTS.

➡ **WRITE FOR COMPLETE DETAILS ON THE TYPE OF OSMOSE SERVICE YOU PREFER**

OSMOSE WOOD PRESERVING COMPANY OF AMERICA, INC.

BUFFALO, NEW YORK

Representatives in: Pittsburgh, Denver, Birmingham, Ala., Stollings & Clarksburg, W. Va., and New York City

includes typical plans for a one-story basementless house, a one-story house with partial basement, a split-level house and a two-story house. Many of the ideas, it is pointed out, can be applied to existing homes.

Research in the use of solid fuels for small homes is sponsored at the University of Illinois by Bituminous Coal Research, Inc., the Anthracite Institute and the American Coke & Coal Chemicals Institute.

Copies of Circular G3.61, "Homes Planned for Coal or Coke," may be obtained free from the Small Homes Council until September 1. After that date they will be priced at 10c each.

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Coal Publications

Conveyors and Related Equipment (second edition), by W. G. Hudson. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., 1949. 468 pp. 6¼x9¼-in; cloth. $7. Information for architects, consultants, plant engineers and student engineers, including layout techniques, performance possibilities and maintenance suggestions, as well as some cost comparisons.

Power Capacitors, by R. E. Marbury. McGraw-Hill Book Co., 330 West 42d St., New York 18, N. Y., 1949. 205 pp. 6¼x9¼-in; cloth. $3.50. A new volume in the Westinghouse - McGraw - Hill Engineering Books for Industry. A convenient gathering of information about relatively large capacitor units and assemblies such as are used on power systems. Capacitor ratings, design, applications, controls, installation and maintenance.

What the Small Plant Can Do About Fly Ash, by C. E. Miller. 8 pp. 8½x11-in; paper. Bituminous Coal Research, Inc., 912 Oliver Bldg., Pittsburgh 22, Pa. 25c. A product of BCR-sponsored research at Battelle Memorial Institute. Graphs to help in estimating cost of cinder collectors and sketches showing how to install collectors in small boiler plants.

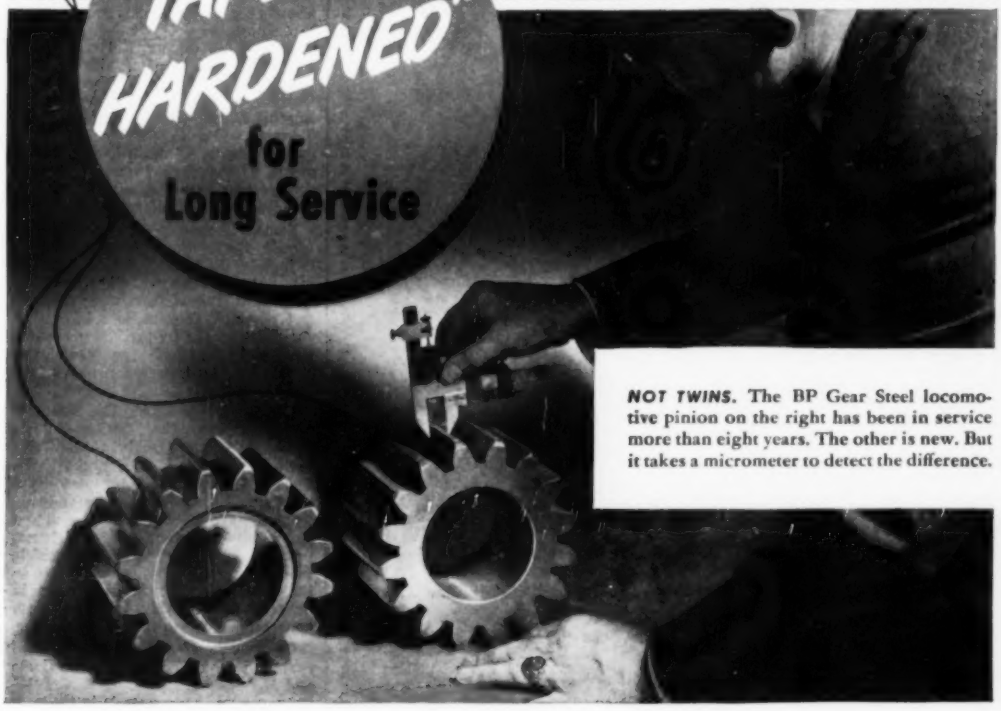
Manual of Instructions on Proper Firing Methods. Smoke Prevention Association of America, Inc., 139 N. Clark St., Chicago 2, Ill. 73 pp. 8½x11-in; paper. 50c. Eleven chapters showing coal dealers, service engineers and homeowners how to burn coal properly. Firing charts and data on stokers and hand-fired equipment.

Coal and Related Solid Fuels Commodity Study. Economic Cooperation Administration. 50 pp. 5⅜x9-in; paper. Price not quoted. U. S. Government Printing Office, Washington 25, D. C. Import requirements under the Marshall Plan, problems related to qualities of coal, coal production in ERP countries and investment programs for the European Coal industry.

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

"TAPER-HARDENED" for Long Service



NOT TWINS. The BP Gear Steel locomotive pinion on the right has been in service more than eight years. The other is new. But it takes a micrometer to detect the difference.

Replacement costs go down when you use gears made of BP Gear Steel. That's because BP Gears are "taper-hardened" by an exclusive Westinghouse process.

First, Westinghouse carefully selects fine grain steel with specific metallurgical properties. Then, BP processing provides extremely hard tooth surfaces to resist wear and assure long service life.

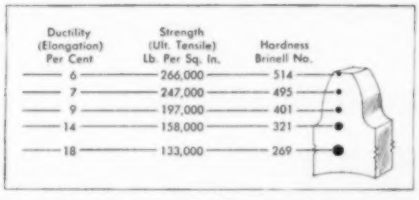
But it doesn't stop there. It's not just a surface "armor". The hardness tapers gradually from surface through the root of the gear tooth for maximum resistance to shock and overload.

Thus, you get the right combination you need for mine service . . . strength, toughness and high resistance to wear.

Gears made from BP gear steel cost no more than ordinary heat-treated gears—and deliveries are prompt.

Get the facts from your nearest Westinghouse office, or write for B-4395, "BP Gear Steel".

Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-07278


Ductility (Elongation) Per Cent
Strength (Ult. Tensile) Lb. Per Sq. In.
Hardness Brinell No.
6 — 266,000 — 514
7 — 247,000 — 495
9 — 197,000 — 401
14 — 158,000 — 321
18 — 133,000 — 269

Westinghouse
GEARED DRIVES

Talk about strength—ARMCO Liner Plates really have it. The tough sinewy kind that isn't burdened with excess weight.

One glance at an ARMCO Liner Section will show you why. See those deep corrugations and flanges. They are designed to provide safe strength without excess weight or bulk. This is why ARMCO Liner Plates cost less to carry a given load than any other type.

High strength-to-weight ratio also means that ARMCO Liner Plates are easy to handle and install. One man can carry, hold and bolt a section into place with simple hand wrenches. Jobs go fast—labor costs are low.

You can have complete confidence in ARMCO Tunnel Liner Plates. Use them to construct sloped or vertical entries, air shafts, escapeways, conveyor tunnels, substations and overcasts. Inside diameters range from 45½ inches to 33 feet. Write for complete information now and be ready for that next job. Armco Drainage & Metal Products, Inc., 1375 Curtis Street, Middletown, Ohio. Export: The Armco International Corp.

ARMCO TUNNEL LINER PLATES

ARMCO

The following publications recently have been released by the U. S. Bureau of Mines. Unless otherwise noted, the publications are available free on request to the Publications Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa. Publications for which there is a charge are available elsewhere, as noted below.

The Carbon-Oxygen Complex As a Possible Initiator of Explosions and Formation of Carbon Monoxide in Compressed-Air Systems, by H. W. Busch, L. B. Berger and H. H. Schrenk. R. I. 4465. 8x10½-in; paper; mimeo. Description of experiments with carbon deposits from air compressors and discussion of results. Illustrations and diagrams.

Some Chemicals from Synthetic Liquid Fuels Processes, by Norma Golumbic. R. I. 4467. 58 pp. 8x10½-in; paper; mimeo. Chemical by-products obtained from gas synthesis and direct hydrogenation; effects of variables on the by-products; properties and uses of the chemicals; products to be expected from various coals.

Coal Hydrogenation: The Effect of Variations in the Coal-to-Vehicle Ratio, by Milton Orchin, G. L. Goldbach, Margaret Wolak and H. H. Storch. R. I. 4499. 10 pp. plus 7 pp. of charts. 8x10½-in; paper; mimeo. Experiments indicate that the extent and rate of liquefaction of coal is not greatly dependent upon the vehicle functioning as a hydrogen donor to the coal and that the slow step in liquefaction probably is not the regeneration of such a vehicle.

Coproducts of Coke in the United States, 1917-1947, by J. A. DeCarlo and J. A. Corgan. I. C. 7504. 8x10½-in; paper; mimeo. Trends in the production and value of gas, tar, ammonia and crude light oil. Diagrams and tables.

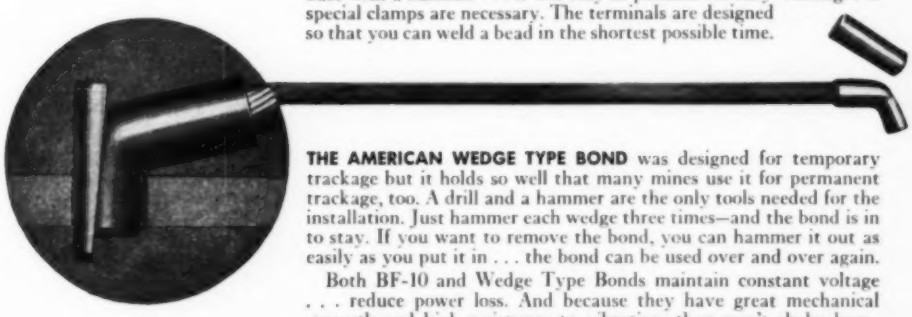
Small Portable Coal-Dust Explosion Gallery, by G. W. Grove and G. L. Freas. I. C. 7520. 8x10½-in; paper; mimeo. Description of a small-scale explosion gallery used by Bureau engineers, mine inspectors and safety instructors to show the dangers of coal-dust ignition and stress the need ror rockdusting.

The Coal Industry of Brazil, Part I: General Economy, Production and Marketing. T. P. 713. 20c, Supt. of Documents, Government Printing Office, Washington 25, D. C. To overcome Brazil's dependence on imports of coal, a wartime commission of American coal specialists made this study and report. The commission suggests modern mining equipment, preparation geared to consumer needs, better combustion methods and lower transportation rates.

Geology of the Deep River Field, Chatham, Lee and Moore Counties, North Carolina, by J. A. Reinemund. A two-sheet map, 33x48 in each. 60c per set, Director, U. S. Geological Survey, Washington 25, D. C.

These bonds are popular with maintenance crews

THE TIGERWELD BF-10 BOND is designed for quick, permanent installation by welding. Just tap the self-clamping terminal onto the rail base with a hammer . . . it will stay in position for easy welding. No special clamps are necessary. The terminals are designed so that you can weld a bead in the shortest possible time.



THE AMERICAN WEDGE TYPE BOND was designed for temporary trackage but it holds so well that many mines use it for permanent trackage, too. A drill and a hammer are the only tools needed for the installation. Just hammer each wedge three times—and the bond is in to stay. If you want to remove the bond, you can hammer it out as easily as you put it in . . . the bond can be used over and over again.

Both BF-10 and Wedge Type Bonds maintain constant voltage . . . reduce power loss. And because they have great mechanical strength and high resistance to vibration, they won't shake loose. Contact our sales office nearest you for complete information on these and other types of U·S·S Tigerweld Rail Bonds. Ask for our Rail Bond Book.

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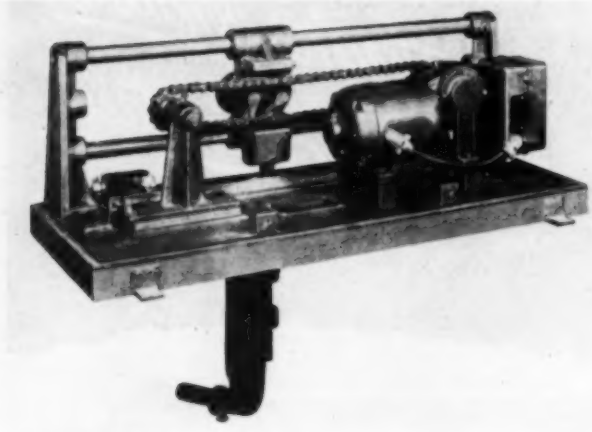
USS

U·S·S American Rail Bonds

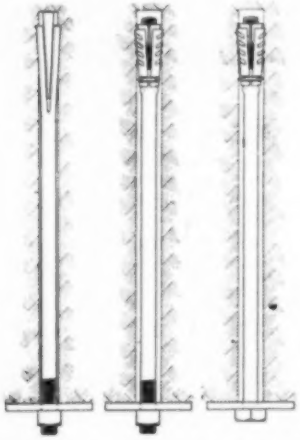
UNITED STATES STEEL

Equipment News

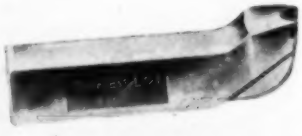
More Detailed Information and Descriptive Literature Normally Are Available on Request Directly to the Manufacturer



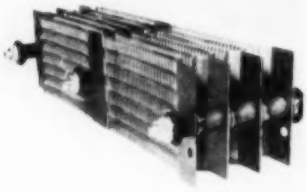
COAL SAMPLER—Automatic sampler (shown with case removed) takes periodic "cuts" (or samples) from a stream of moving material, either wet or dry, at any stage in a continuous process. Entirely automatic, the unit can be set to operate at a variety of time intervals from 5 to 60 min. With the cutter movement carefully controlled to avoid stroke speed and length variation, according to the company, the sample cutter moves horizontally at a constant speed across the stream of moving material, diverting a representative sample into a desired container. Bulletin 47 available.—*Hardinge Co., Inc., York, Pa.*



ROOF-SUSPENSION BOLTS—New line of roof-suspension bolts designed for wide variety of mining conditions includes (left to right, above) wedge, stud-expansion and bolt-expansion types. The wedge type for permanent non-recoverable installation consists of a slotted bolt of any required length, steel wedge, washer and nut and requires a drilled hole only ¼ in. larger than bolt diameter. Stud-expansion bolt includes bolt, steel expansion sleeve, expansion arbor, washer and nut and requires a hole ½ in. larger than the bolt, with all parts recoverable except the expansion unit. The bolt-expansion type is similar to the stud type, except that it has a standard forged bolt head instead of a nut on the threaded end. Either flat or angle washers are available with the units, in any specified sizes or thicknesses.—*West Virginia Steel & Mfg. Co., Huntington, W. Va.*



CUTTER BITS — New-type heavy duty Carboloy carbide-tipped coal-cutter bits are designed for use on all coal-cutting machines using ½x1-in. bits, including continuous types. Features cited by the manufacturer include: greater tip thickness and maximum support for the carbide; reduced power consumption under severe conditions and free cutting under ordinary conditions as a result of a relatively narrow cutting end; minimum shank grinding required in sharpening bits; flat-bottom shank design permitting setting of the bit to any gage size within its range for accurate distribution of cutting loads; and location of the shank tip at the cutting end flush with the carbide tip to permit free flow of coal and minimize bugdust.—*Carboloy Co., Inc., Detroit 32, Mich.*



RESISTORS — New-type "Multipath" resistor using a precision-cut alloy sheet metal slit and formed into a mesh-type construction is said to be a comparatively lightweight unit offering an increased surface area for a correspondingly large amount of heat dissipation. A special fabricating machine is said to permit the mesh being made integrally with an uncut edge, and with the mesh formed of the same metal as the support, there is no electrical or mechanical break. The mesh is self-supporting and is not shielded by insulators, so that there is free access of air and unrestricted radiation over the surface area, according to the manufacturer. Units are available in various types and capacities. Bulletin available.—*Exmet Electrical Corp., 59 Park Ave., New York 16.*

ELECTRIC MOTORS — Westinghouse Type CS totally-enclosed fan-cooled squirrel-cage motors with copper fins embedded in the stator laminations for additional cooling are said to require little more installation space than open motors of the same rating, because of the excellent heat-transfer ability of the copper. Designed for a variety of indoor appli-

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SHEAVES

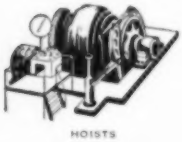
CAGES

SKIPS

LOWERING SPIRALS

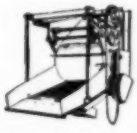
CAR PULLER AND RETARDERS

LABORATORY CRUSHERS



HOISTS

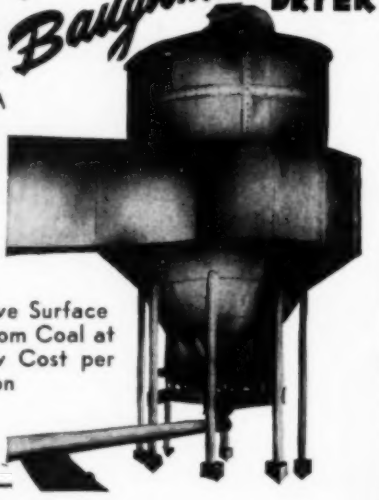
VIBRATING SCREENS



DUSTOLATORS

Wet Coal Can Be Dried Economically

NEW! Baughman VERTI VANE DRYER



Will Remove Surface Moisture from Coal at a Very Low Cost per Ton

CHECK THESE FEATURES—

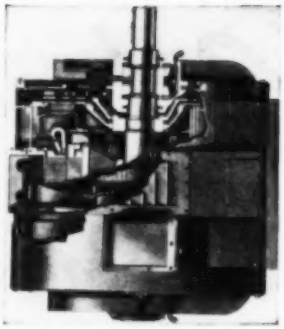
1. Degradation is negligible.
2. Slow movement of coal permits low temperature gases.
3. Low temperature operation prevents overheated product and increases furnace life.
4. Cooling chamber assures cool dried coal.
5. Vertical construction requires minimum floor space.
6. Coal movement control eliminates need of dust collectors.
7. Fine coal may be left in wet product, thus making auxiliary drying equipment unnecessary.
8. High thermal efficiency gives more dried product per quantity of drying heat produced.
9. Initial cost lower than other type dryers.
10. Operating costs and horsepower requirements are exceptionally low.
11. Operation and controls are extremely simple.
12. Outstanding for continuous service without shutdowns for maintenance.
13. High maximum hourly tonnage capacity.
14. Easily adjusted for rate of feed.

Write us for further information about Baughman Verti-Vane Coal Dryers. Our sales and technical staffs are always ready to help you solve specific coal preparation problems.

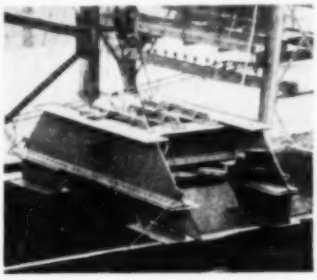
ENGINEERS, MACHINISTS
STEEL FABRICATORS
PATTERN MAKERS
GREY IRON FOUNDERS

DANVILLE ROBT. HOLMES BROS. ILLINOIS

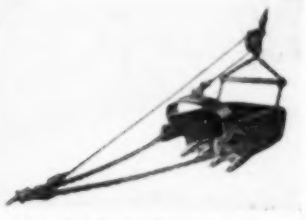
ROBERT HOLMES & BROS., INC.
DANVILLE, ILLINOIS



cations where the atmosphere is contaminated with dust particles injurious to open motors, the units are available in large ratings up to approximately 1,500 hp. at 1,800 rpm., Class B insulation, 75-deg. C rise.—*Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.*



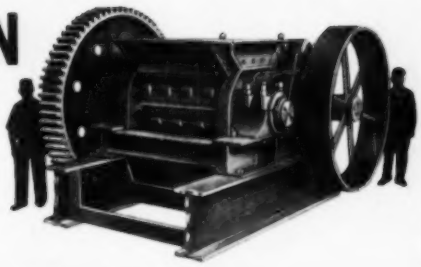
CAR UNLOADER—New Robins Model GS Car shakeout is a lightweight unit weighing under 3½ tons designed to unload up to 15 hopper-bottom cars in a day at an installation cost attractive to a 2-car-a-day operation, according to the manufacturer. Because of its light weight, installation cost of hoist, structure and motor is reportedly kept to a minimum. The entire unloading cycle requires only a few minutes, with the unit placed on the top of the car, not attached to it. Bulletin 130 available. —*Robins Conveyors Div., Hewitt-Robins, Inc., 270 Passaic Ave., Passaic, N. J.*



DRAGLINE BUCKETS—New series of Featherweight Perforated dragline buckets available in sizes ⅜ to 2 cu yd are reported to be 20 to 40% lighter. Of welded construction

* MODERNIZATION

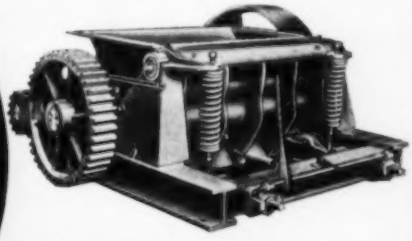
* The difference between Profit and Loss in Today's Competitive Market



Rockmaster Crushers

· All Steel Constructed · Cast Steel Gears · Automatic Steelstrut toggle for Tramp Iron Protection · Chilled Alloy Iron or Steel, Interchangeable and Reversible Crushing Plate Liners on easily removable crushing plate · Heavy Split Bronze Bearings · Greatest Crushing Range with Opening Easily Adjustable

McLANAHAN EQUIPMENT *is Rugged and Modern!*



Black Diamond Crushers

guaranteed highest ton-per-dollar value!

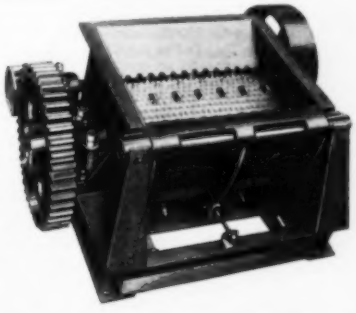
One piece, rigid, well proportioned steel frame, cut steel gears, split bronze bearings, V-belt drive and industrial type lubrication. Automatic tramp iron protection and quick adjustment.

Typical equipment McLanahan and Stone designs and builds:

- Heavy Duty Rock Crushers—Automatic Steelstrut Toggle, Quick Adjustment and Pioneer series
- Light Duty Single Rolls—Black Diamond and Bantam Buster in steel, semi-steel or fabricated frames
- Double Roll Fabricated Steel Crushers
- Jaw Crushers
- Portable and Semi-Portable Crushing Plants
- Dry Pans Super Heavy Duty
- Conveyors
- Dryers of Revolving Type
- Elevators
- Feeders
- Hoists
- Ore Jigs
- Sand Drags
- Screens
- Log Washers & Scrubbers
- Special Machinery and Complete Plants

Bantam Buster Crushers

The McLanahan Bantam Buster Fabricated Steel frame crushers answer the need for a dependable, low cost machine that does the job with minimum operating and maintenance expenses. These rugged, high-ratio crushers take a larger feed than equivalent crushers. They easily crush different size feeds of hard and soft coal to various size products.



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McLANAHAN and STONE Corp.

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Since 1835

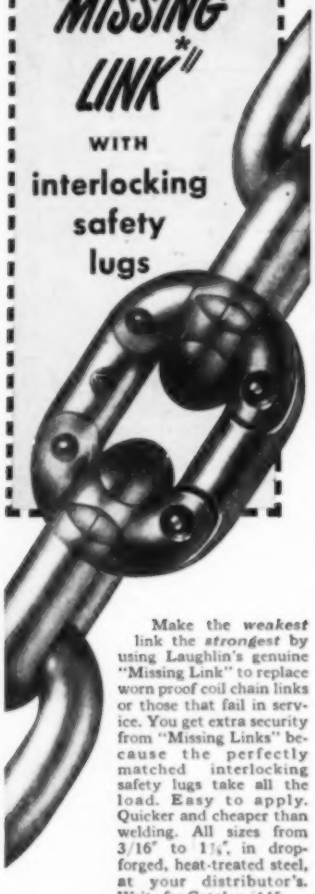
Stronger than the chain itself!

THE LAUGHLIN

"MISSING LINK"*

WITH

interlocking safety lugs



Make the *weakest* link the *strongest* by using Laughlin's genuine "Missing Link" to replace worn proof coil chain links or those that fail in service. You get extra security from "Missing Links" because the perfectly matched interlocking safety lugs take all the load. Easy to apply. Quicker and cheaper than welding. All sizes from 3/16" to 1¾", in drop-forged, heat-treated steel, at your distributor's. Write for Catalog #145 . . . industry's data book of fittings. THE THOMAS LAUGHLIN COMPANY, DEPT. 6, PORTLAND 6, MAINE.

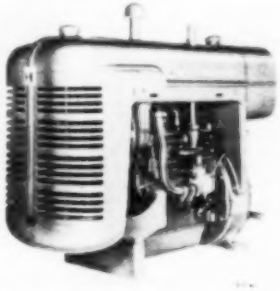
*Reg. U. S. Pat. Off.

LAUGHLIN

THE MOST COMPLETE LINE OF DROP-FORGED WIRE ROPE AND CHAIN FITTINGS

COAL CRUSHER—Eagle "Coal Cracker," a completely self-contained lump-coal reduction unit particularly designed for small mines and large users of coal, is said to produce 30 to 50 tph of small egg or nut coal with a minimum of fines, handling up to 10-in lumps. The unit is powered by a V-belt drive and is available with either a 10- or 15-hp. 220-440-volt ac motor and with a choice of gears to provide either ⅝ to 1⅝ or 1⅝ to 2¾ sizes. A simple roll-spacing adjustment permits exact setting to sizes with these limits and adjustable tension springs prevent damage to the rolls from stones and tramp iron, according to the company. Catalog 64 available.—*Eagle Iron Works, Des Moines, Iowa.*

with 14% manganese steel for the lip and socket-point-type teeth, sheave, wirerope sockets and dump-chain links, the buckets feature wide-set corner teeth and a sharp cutting edge and, the company says, requires only two-thirds of the drawbar pull and two-thirds of the distance for filling. —*Pettibone Mulliken Corp., 7400 W. Division St., Chicago 51.*



GASOLINE ENGINE—Addition of the U-1 16 hp 4-cylinder gasoline engine, particularly adaptable to powering fans or blowers, oil or water pumps, generators, portable in-plant or outdoor units and other such installations, reportedly expands the International line of carbureted engines to five, ranging up to 55 rated hp. It is available as a stripped engine or with job-engineered attachments up to a complete power unit and can be equipped to operate either on gasoline or natural gas. Stripped, the U-1 delivers a maximum of 16.3 bhp at 2,500 rpm. With fan, radiator and air cleaner, it develops a maximum of 16 working horsepower. Over-all engine dimensions are: length, 26 13/32 in; width, 16 11/32 in; height, 25 in. Bulletin A-117-MM is available.—*International Harvester Co., 180 N. Michigan Ave., Chicago* 1.

STORAGE BATTERIES — New "Z"-plate now standard on all Gould "Kathanode" and "Thirty" storage

"There's Safety in *these* Numbers"

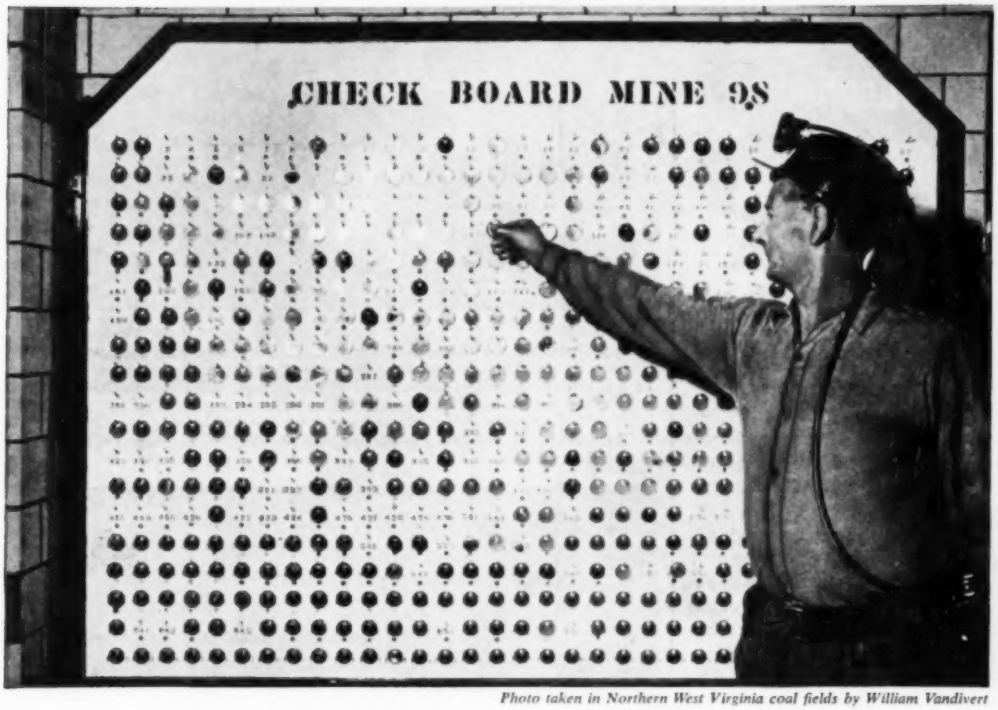


Photo taken in Northern West Virginia coal fields by William Vandivert

When a man goes underground in most modern coal mines, he removes an identification tab from a board like the one shown here. It provides a visual check on *each* man, which is as basic a step in any mine-safety program as "counting the noses" in a large family after a day at the county fair.

This simple measure is one of dozens of practices aimed to make mining safer. Indeed, modern mining techniques make it possible to offset almost every hazard of mining except one—and that is the natural human tendency to become calloused to danger.

In fact, U. S. Bureau of Mines records show that individual carelessness, not spectacular mine disasters, add up to the big majority of *all* accidents. That's why trained safety experts strive to make *all* miners safety-minded, every hour of every day. Beyond that, the industry invests over 80 million dollars *annually* in health and safety equipment. As a result of co-operative efforts among operators, unions, and government, last year's coal mining safety record was the best since the Bureau of Mines first began keeping figures *over 39 years ago.*

Any discussion with mine safety experts about safety in America's coal mines winds up in agreement on one point. The problem of mine safety is a problem in human nature.

That's why the industry, through the efforts of its industrial mine-safety supervisors, works hard to popularize mine-safety concepts. They not only talk safety, display safety measures in specially designed posters, but even "sloganize" safety. One example of this last is the use by miners of the phrase *"Be careful"* as a casual greeting whenever and wherever they meet each other in the mine passageways underground.

BITUMINOUS COAL

BITUMINOUS COAL INSTITUTE

A Department of National Coal Association

WASHINGTON, D. C

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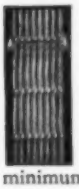
with

Cambri-Wedge

Wire Screens for Dewatering, Classifying

This cross section drawing shows how wedge-shaped members of Cambri-Wedge Wire Screens reduce clogging. Any dirt particles small enough to fit through the top opening between adjacent wires fall freely through the entire screen. Special Riffle Surface wire gives minimum moisture content in dewatered slurry — more complete dewatering.



FREE—learn all the advantages of Cambri-Wedge screens. See how they will save time, money, maintenance in your preparation plant. Mail coupon today. Also ask about regular woven stainless screens.

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Wire cloth in rolls. | Also specialized wire fabrications

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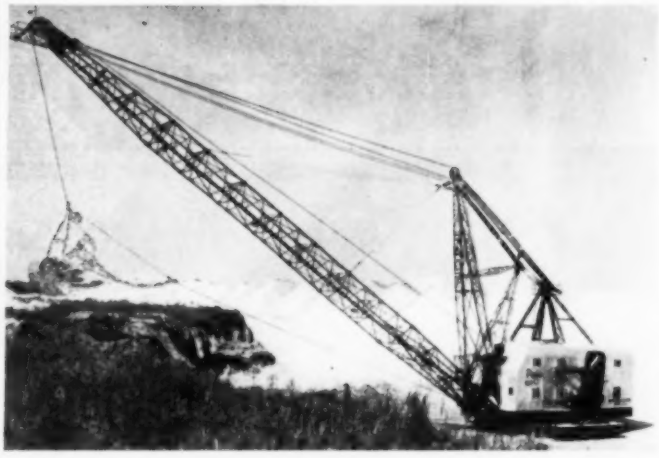
☐ Also send data on woven stainless screens

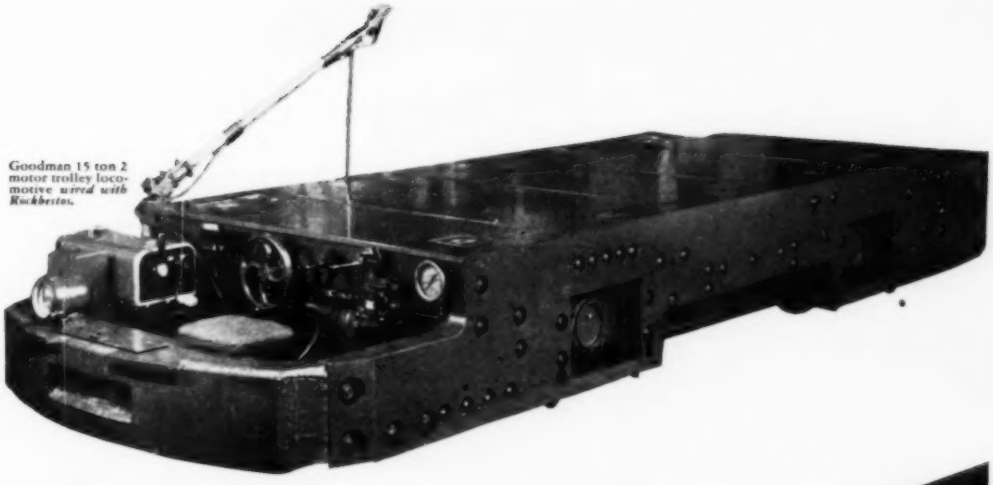


DRAGLINE MAST SAFETY CONNECTOR—Model 625 Page dragline equipped with a 150-ft boom and 9-cu yd bucket is shown with the new adjustable rigid safety connection between the fixed and movable masts, which will be a standard feature of all future Page draglines. With the new connection holding the boom securely at various angles without the use of cables, the boom hoist cable is used only for raising and lowering the boom and as an added safety precaution, according to the company.—*Page Engineering Co., Clearing Post Office, Chicago 38.*

DIESEL-ENGINE MAINTENANCE—New "Mobile Training Unit" developed for training owners and operators of G.M. Series 71 Diesel engines in maintenance and servicing of the units is contained in GMC 2-ton cab-over-engine truck equipped with extensive training equipment. Staffed by two experienced instructors from the company's service-training staff, the unit is currently touring the country with a special program of 2- or 3-day courses and will visit major construction and mining projects, as well as stop at GM distributor points where groups of personnel from individual operations can be assembled.—*Detroit Diesel Engine Div., General Motors Corp., 13400 W. Outer Drive, Detroit, 28.*

batteries is said to incorporate a new and improved grid that offers improved electrical characteristics. Manufactured with exclusive new casting rates and new molding techniques that reduce grid porosity and vulnerability to sulphuric-acid attack, the new Z-plate will provide longer battery-service life, according to the company.—*Gould Storage Battery Corp., Trenton, N. J.*

TRUCK TIRE—New "Super Highway" tire built especially for high



Goodman 15 ton 2 motor trolley locomotive *wired with Rockbestos.*

How to get best maintenance results

with least maintenance expense

To get maximum dollar value from every mechanized unit in your mine . . . to keep it always performing like new . . . all you have to do is supply normal good maintenance. In the case of internal wiring, "normal good maintenance" should include ROCKBESTOS . . . the cable built expressly for tough mining conditions. Its permanent impregnated felted asbestos insulation means that ROCKBESTOS cable can't burn...can't support flame... lasts longer.

P.S. Leading mining equipment makers—such as Goodman—supply ROCKBESTOS wire and cable on new machinery . . . a good thing to remember when it's time to replace worn-out wiring in your old equipment!

ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONN.

NEW YORK CLEVELAND DETROIT CHICAGO
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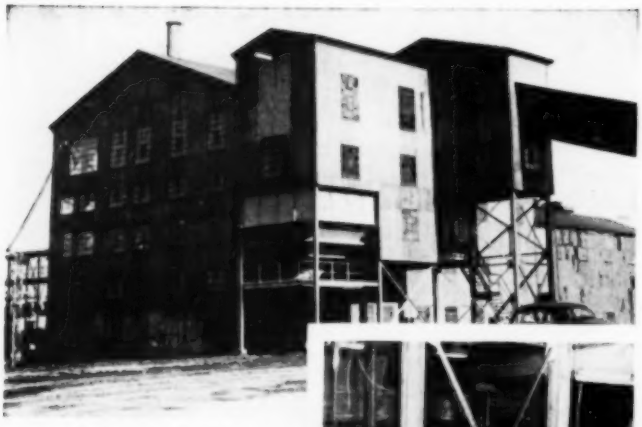
WIRES and CABLES by

ROCKBESTOS

. . . . . ***dare to be better***

ORDER FROM THESE JOBBERS—SPECIFY "ROCKBESTOS A.V.C."

BECKLEY, W. VA.: National Mine Service Co.
BIRMINGHAM, ALA.: Moore-Handley Hdwe. Co.
BLUEFIELD, W. VA.: Superior-Sterling Co.
CHARLESTON, W.VA.: Charleston Elec. Supply Co.
CLARKSBURG, W.VA.: Westinghouse Electric Supply Co.
CLEVELAND, OHIO: Upson-Walton Co.
EVANSVILLE, IND.: Evansville Elec. & Mfg. Co.
FAIRMONT, W. VA.: Fairmont Supply Co.
HUNTINGTON, W. VA.: Banks-Miller Supply Co.
JENKINS, KY.: National Mine Service Co.
LOGAN, W. VA.: National Mine Service Co.
LOTHAIR, KY.: Mine Service Co.
MIDDLESBORO, KY.: Rogan & Rogan Co.
PITTSBURGH, PA.: Upson-Walton Co.
Westinghouse Elec. Supply Co.
SCRANTON, PA.: Penn. Elec. Engineering Co.
WHEELING, W.VA.: Westinghouse Elec. Supply Co.
WASHINGTON, PA.: Fairmont Supply Co.
WILLIAMSON, W.VA.: Williamson Supply Co.



Exterior view of Central Indiana Coal Company's Maid Marian Mine, Odon, Indiana. Insert: Interior view showing the three Deister Plat-O Coal Washing Tables.

Tipple Foreman says:

"Deister PLAT-O Tables *Can Really Clean Coal*"

Homer Miller, tipple foreman at Central Indiana Coal Company's Maid Marian Mine, Odon, Indiana, sure likes his three Deister Plat-O Coal Washing Tables. He says: "Deister Plat-O Tables can really clean coal. We have never had a bit of trouble with them in almost a year and a half of operation. One man takes care of the three tables along with all of the other equipment in this section of the tipple."

The Maid Marian Preparation Plant went into operation in December, 1947, and has one of the most modern tipples in the country. It is rated at 500 tons per hour, raw-coal feed. The three Deister Coal Washing Tables clean the minus 10 mesh dewatered coal from two 12' x 40' sludge collection tanks. Feed is rated at 25 tons per hour.

For complete information on how Deister Plat-O Coal Washing Tables can improve *your* mining operations, write the Deister Machine Company.

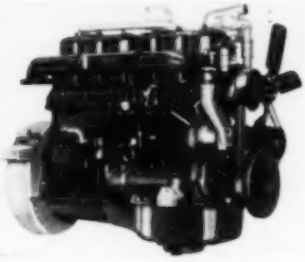
DEISTER

"PLAT-O TABLES"

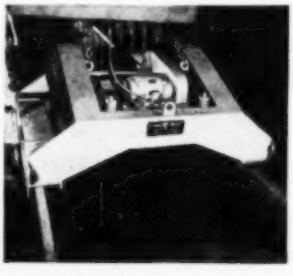
DEISTER MACHINE CO.

FORT WAYNE 4, INDIANA

speed long-distance service in over-the-highway hauling is made in sizes from 8.25:20 10-ply rating through 11.00:24 12-ply rating. The tire has a flatter design permitting greater road contact, according to the company, with the non-skid depth of the tread averaging 13.5% deeper than standard tires and crown thickness averaging 21% more. The body is made with rayon cord and with the company's exclusive Nylon shock shield to reduce the possibility of tread separation. Cords are the weftless full-floating even-tension type that help reduce tire growth and provide added bruise resistance, it is said.—*B. F. Goodrich Co., Akron, Ohio.*



DIESEL ENGINES — Three new Mack diesel engines, the END 457, 510 and 672 (illustrated above), have been built for Mack trucks exclusively and are specifically designed for tractor-trailer combinations of 40,000 lb gcw and up. Operating on the four-stroke cycle, the engines feature controlled combustion and maintenance of low peak pressures, according to Mack. Variable and automatic injection timing, synchronized to the speed of the engine, is provided by the company's exclusive Synchrovance. A close-coupled fuel injection pump rigidly mounted on the block is said to produce equal injection of fuel to all cylinders for uniform power strokes without fuel wastage.—*Mack Trucks, Inc., Empire State Bldg., New York.*



CAR UNLOADER — Link-Belt car shaker, a compact self-contained vibrator unit, designed for rapid unloading of open-top hopper-bottom cars, is lowered by a hoist to the top of the car and imparts heavy hammer-like blows that loosen and unload the material. Eliminating the destructive use

HERE'S WHAT REPUBLIC DISTRIBUTORS DO FOR YOU—

Pioneers in the use of
COLD RUBBER

TOWER PNEUMATIC HOSE

For standard working pressures —in sizes from 3/8" to 1-1/2" inside diameter.

Mr. Richard Alcott, Vice Pres. and Gen. Mgr.
The Riechman-Crosby Co.
223 South Front St. Memphis, Tenn.

Eliminate Guesswork with TOWER HOSE for your pneumatic tools

"You can quickly recognize the high quality of Tower Pneumatic Hose," says Mr. Alcott, pictured above. Republic's strong braided cord plies, impregnated and imbedded in resilient rubber, provide a strong wall to withstand high pressures. As the hose is dragged from place to place a tough, resilient brown cover resists cutting, abrasion, and wear. The tube, specially designed, resists damages of heated oil from compressors. You will find Tower Pneumatic Hose on pneumatic tools in factories, foundries, railroads, shipyards, mines, quarries and on structural work throughout the world.

If you want long service Tower Hose, look in the classified section of your telephone directory for the Republic distributor's name, write or mail the coupon.

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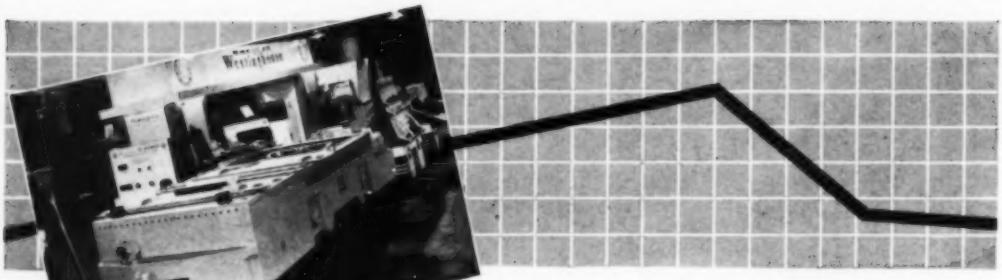
Lee Deluxe Tires & Tubes · · Conshohocken, Pa.



WESTINGHOUSE ELECTRIC CORP.

IRWIN FOUNDRY & MINE CAR CO.

AMERICAN CAR & FOUNDRY CO.

GENERAL ELECTRIC CO.

HAULAGE COSTS DROP WITH "Willisons" ON THE JOB!

As indicated by exhibits at the 1949 Coal Show of the American Mining Congress, leading producers are specifying "Willison Automatic Couplers" for mine cars, locomotives and mantrips. Three good reasons account for this growing preference.

1. **Versatile Willisons** excel in economy, speed and efficiency. Car movements are faster because couplers are in operating position. Either end couples instantly with any other Willison-equipped car. The few simple, sturdy parts require little maintenance.
2. **Safe Willisons** eliminate necessity for a man to go between cars during coupling or uncoupling.
3. **Rugged Willisons,** with their greater strength for less weight, permit more payload with less dead weight on every trip.

Large and small operators have proved that haulage costs go down and safety increases when Willison Automatic Couplers are on the job. It will pay you well to investigate what Willisons can do for you.

NATIONAL Products FOR TRANSPORTATION AND INDUSTRY

Est. 1868

NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

CLEVELAND, OHIO

WILLISON AUTOMATIC COUPLERS • NACO STEEL WHEELS • NACO STEEL LINKS AND SWIVEL HITCHINGS

of picks, sledges or air hammers, the car shaker operates with a low-frequency vibration that causes no greater stress to the cars than experienced in normal travel, according to the company. Bulletin 2345 available. —*Link-Belt Co., 300 W. Pershing Rd., Chicago 9.*

SHUTTLE-CAR CABLE—New shuttle-car cable features "ribbed" or "gear-shaped" insulated conductors whose shape is said to prevent their slipping inside the jacket when in service and reportedly provides greater adhesion between the insulated conductor and the jacket.—*Simplex Wire & Cable Co., 79 Sidney St., Cambridge 39, Mass.*

POWER WHEELBARROW—Three-wheeled rubber-tired Power Cart, driven by a 7-hp 4-cycle gasoline motor, reportedly has speed of 8 to 10 mph and can climb grades of 20% with its 2,000-lb rated load.—*Gar-Bro Mfg. Co., 2416 E. 16th St., Los Angeles, Calif.*

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Industrial Notes

Westinghouse Electric Corp., Pittsburgh, Pa., has announced comprehensive executive changes designed to provide more adequately for the firm's greatly expanded postwar activities and new product lines, with separation of industrial- and consumer-product responsibilities at the top level. L. E. Osborne, vice president, has been assigned staff supervision over all the company's manufacturing activities. James H. Jewell, recently elected vice president, takes over staff supervision of all sales and marketing on a company-wide basis. John K. Hodnette, vice president and head of the transformer division at Sharon, Pa., becomes general manager of industrial products, with

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do you?

Your Safe is designed primarily for fire protection of your valuable records.

a Mosler Money Chest

gives you all-out burglary protection for cash and valuables.

Nationwide tests by chain-store companies show fewer burglary attempts where a Mosler Armored-Steel Money Chest is given prominent display.

Pays for itself in the savings on burglary insurance alone. Quick return on your investment. Check this with your insurance man.

Low in cost. Mosler Money Chests are available in concrete block or for welding into place in your present safe. You will be surprised at the moderate cost. There are Mosler Money Chests designed to meet any home or business need.

The Mosler Safe Co.

Main Office: 320 Fifth Ave. New York 1, N. Y.

Dealers in principal cities
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Largest Builders of Safes and Vaults in the World

Builders of the U.S. Gold Storage Vault Doors at Fort Knox, Ky.

FILL OUT AND MAIL—TODAY!

THE MOSLER SAFE CO., DEPT. 85
320 FIFTH AVE., NEW YORK 1, N. Y.

☐ Please send me further information on how to save money on burglary insurance.

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Independent Electric Power for the Mines!

READY-POWER
ENGINE GENERATORS
Direct or Alternating Current

Where Electric Power—generated at the mine—is needed—Ready-Power Standardized Engine Generators are available for early delivery. Built for this service from standardized designs developed after years of experience, Ready-Power will give you—QUICKLY—Dependable, Low Cost, Electric Power.

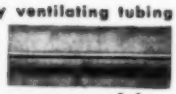
Ready-Power Engine Generators are powered by International Harvester Engines—sold and serviced everywhere by International Harvester Power Unit Dealers.

Rated at 7½ to 85 KW AC or 7½ to 100 KW DC.

The READY-POWER Co. 11231 FREUD AVE. DETROIT 14, MICH.

Use *FLEXIPIPE* . . . the quality ventilating tubing

FLEXIPIPE



Directs fresh air where you need it

The new improved Flexipipe is efficient, serviceable and economical. It's made in a variety of diameters and lengths and with various accessories to take care of your individual requirements. Write us for complete information and sample.

BEMIS BRO. BAG CO.
412 Poplar Street, St. Louis 2, Mo.
FLEXIPIPE: Reg. U. S. Pat. Off.

supervision over all operating divisions making industrial goods and the district sales organizations. John M. McKibbin, also a recently elected vice president and former head of advertising and sales promotion, now is appointed general manager of consumer products. Mr. Hodnette has announced the following appointments: Tomlinson Fort, manager, apparatus sales department; William W. Sproul, sales manager, industrial products; and Royal C. Bergvall, engineering manager, industrial products.

Electric Storage Battery Co., Philadelphia, has announced the retirement of William Van C. Brandt, manager of the Exide railway and motive power battery sales division. Mr. Brandt attended the U. S. Naval Academy with the Class of 1911 and the following year joined the company as a sales engineer. In World War I, he served as a Naval Reserve officer in submarine service and on transport duty. In World War II, Mr. Brandt served with the Navy as a Commander, U. S. N. R.

U. S. Rubber Co., New York, has named F. M. Urban sales manager of engineered rubber products and H. Leon Moran as factory manager, Ft. Wayne (Ind.) plant. Mr. Urban was formerly merchandise manager for the mechanical goods division and Mr. Moran has been manager of engineered rubber products at Ft. Wayne.

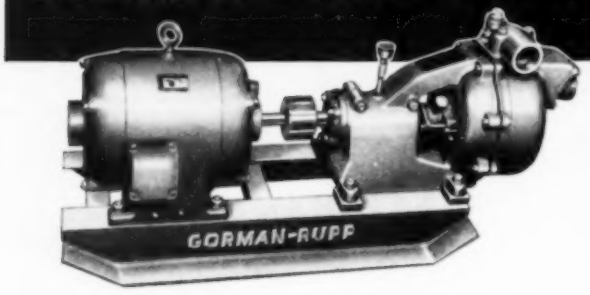
Allis-Chalmers Mfg. Co., Milwaukee, Wis., has promoted Robert S. Fleshiem from manager of its electrical department to assistant to W. C. Johnson, executive vice president of the company's general machinery division, succeeding J. D. Greensward, recently named general manager of the company's Norwood (Ohio) works. Roy M. Casper, manager of the motor and generator section, has been named manager of the company's electrical department.

Mack Trucks, Inc., New York, has started a mobile demonstration unit on a five-months tour of the United States and Canada to present its new line of diesel engines and bring the facts of diesel economy directly to truck operators. The semi-trailer pulled by a Mack diesel-powered tractor will exhibit the company's three new diesel engines, the End 457, 510 and 672, and other products. A. G. Crockett, Mack's director of market research, in charge of the exhibit, will put on a comprehensive diesel show and demonstration for invited audiences, featuring the theme, "Can I Use Diesels?"

Firth Sterling Steel & Carbide Corp., McKeesport, Pa., has appointed Howard M. Dawson sales manager of Mid-Eastern district New York and Philadelphia offices, succeeding A. E. Baker, promoted to assistant to president. Mr. Dawson was formerly

WEIGHED . . . on the run!
With Fairbanks-Morse Belt Conveyor Scales, material can be weighed in transit . . . automatically. Installed as an integral part of your belt conveyor system, these accurate units automatically indicate the weight of materials carried by the conveyor belt while in operation and show the accumulated total. There is no need for an extra weighing operation at a remote point to add to handling costs . . . impede material flow. Your Fairbanks-Morse weighing expert will be happy to give you the complete facts on the belt conveyor scale. Fairbanks, Morse & Co., Chicago 5, Ill.
FAIRBANKS-MORSE
A name worth remembering
DIESEL LOCOMOTIVES • DIESEL ENGINES • PUMPS • SCALES
MOTORS • GENERATORS • STOKERS • RAILROAD MOTOR CARS
and STANDPIPES • FARM EQUIPMENT • MAGNETOS

LOW HEADROOM ?
Simply Specify
GORMAN-RUPP PUMPS



A LOT OF PUMP IN A SMALL SPACE

These husky, self-priming, centrifugal mine gathering pumps will handle large quantities of water yet take unbelievably small headroom – from 13½" to 21¼", depending upon size. (pump only)

Ideal for remote locations and automatic operation – requiring little or no attention, operating 24 hours a day, continuously, day after day without shut-down.

Positive and powerful self-priming. No adjustments required between prime and run – start the motor and you start the water.

Sand, muck or solids that will pass the intake strainer WILL NOT CLOG or harm a Gorman-Rupp.

Absolute Simplicity – only one moving part, the impeller – no reduction gears or valves. All wearing parts can be quickly replaced by an inexperienced man with common tools.

You can't beat a Gorman-Rupp for dependability and performance. Available in capacities from 50 to 200 GPM and heads up to 125 feet. Write today for special mine bulletin showing some interesting actual installations, or contact your nearest distributor.

Check THIS LIST FOR YOUR NEAREST GORMAN-RUPP DISTRIBUTOR

Guyan Machinery Co., Logan, W. Va.
Weinman Pump & Supply Co., Pittsburgh, Pa.
McComb Supply Co., Harlan, Ky.
Bittenbender Co., Scranton, Pa.
Industrial Supply Co., Terre Haute, Ind.
Hoe Supply Co., Christopher, Ill.
Greenville Supply Co., Greenville, Ky.
General Machinery Co., Birmingham, Ala.
Superior Sterling Co., Bluefield, W. Va.
Athens Armature & Machinery Co., Athens, Ohio.
Tennessee Mill & Mine Supply Co., Knoxville, Tenn.
Mine Service Co., Lothair, Ky.
Reliable Electric Co., Zanesville, O.
Cambridge Mach. & Supply Co., Cambridge, Ohio.
Medico Elec. Motor Co., Pittston, Pa.
Buckeye Machine Supply Co., New Philadelphia, Ohio.
W. Va. Pump & Supply Co., Huntington, W. Va.
Central Mine Supply Co., Mt. Vernon, Ill.

THE GORMAN-RUPP COMPANY
305 BOWMAN STREET, MANSFIELD, OHIO

president, Jessop Steel International Co., New York.

Chain Belt Co., Milwaukee, Wis., has appointed Charles Moeller, formerly in its factory organization, a district sales engineer with the Kansas City office.

Atlas Powder Co., Wilmington, Del., has announced the retirement under the company's pension plan of J. T. Power, director of the development department; R. E. Caskey, special Midwest representative and former manager of the Joplin district; A. P. Klenner, resident manager at Houghton, Mich.; and W. H. Tuke, special representative at Pittsburg, Kan. Mr. Power and Caskey have been associated with the company for 42 years, Mr. Tuke for 33 years and Mr. Klenner for 48 years.

General Electric Co. has named John A. Kelly assistant to the manager of sales for its construction materials department, Bridgeport, Conn. Leo J. Halkovich has been appointed a district representative for the department in the wholesale trading area of Johnstown and Altoona, Pa. William L. Immer, manager of sales service for the welding equipment division, has been named a wire and cable specialist for the Central district of the construction materials department, with headquarters in St. Louis. Don C. McKinley, formerly in charge of air conditioning and refrigerator sales in the New York district, has been named a wire and cable specialist for the Southeastern district, with offices in Atlanta, Ga.

Pennsylvania Crusher Co., Philadelphia, Pa., a division of Bath Iron Works Corp., has appointed John A. Plimpton as division manager. Mr. Plimpton succeeds Stanley D. Hartshorn, who has completed 25 years of service with the company. Mr. Hartshorn will continue with the organization as consultant on sales and engineering problems and as independent sales agent in New York state and Eastern Canada. Mr. Plimpton was formerly New York district manager for the company.

Commercial Testing and Engineering Co., Chicago, has announced the organization of its engineering department as separate subsidiary division, to be known as Carroll, Bechtel & Langtry. There has been no change in organization and responsibility of the department, which was organized at the end of World War I and has specialized in power-plant consulting engineering and combustion efficiency.

LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa, has named J. W. Schoen, formerly assistant to the general sales manager, sales manager, succeeding E. R. Galvin, resigned.

Centrifugal & Mechanical Industries, Inc., St. Louis, Mo., has appointed to its staff of field represen-

HOW MANY TONS does bad weather cost you?

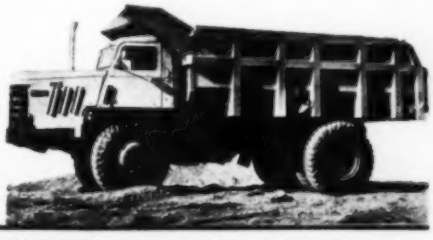
If your pit-to-plant hauling slows down or stops during heavy rains, snows, freezing, thaws and other adverse conditions . . . you are being "taxed" heavily in lost tonnage and idle equipment each year.

IS THERE A REMEDY? Yes . . . haul with Walter Tractor Trucks and enjoy "weatherproof" hauling. You get the economy of hauling 20-30-40 ton payloads, in any weather, in any season, on or off the road.

This is possible only with the Walter Four-Point Positive Drive, which provides 100% positive traction in all four driving wheels—two front, two rear. There is no wheel-spinning, slipping, or stalling in soft mud, dirt, sand, ice, slippery surfaces or grades.

Learn more about big, powerful, rugged, maneuverable Walter Tractor Trucks for open pit mine hauling. Have a hauling engineer call—or write for detailed literature.

WALTER
4-POINT POSITIVE DRIVE
TRACTOR TRUCKS

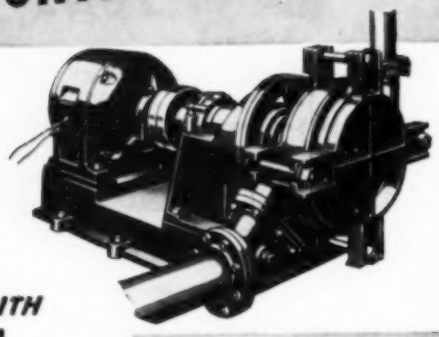


Above: 300 hp. Walter Tractor Truck with 30-ton bottom dump coal trailer.

Right: 200 hp. Walter Tractor Truck with 20 cu. yd. back dump body.

WALTER MOTOR TRUCK COMPANY, 1001-19 IRVING AVE., RIDGEWOOD 27, QUEENS, L. I., N. Y.

Longer Hours of... CONTINUOUS SERVICE



WITH A **MORRIS** TYPE R SLURRY PUMP

The 4 features of the Morris Type R Slurry Pump mean low-cost operation ... minimum "lay up" time.

1. **Easily dismantled**—Impeller and shaft sleeve are renewable without disturbing piping or bearings.

   Four easy-to-get-at outside clamping bolts hold impeller, liner, shell and cover firmly in place.

2. **Simpler design**—The Morris Type R Slurry Pump has no troublesome internal bolts or studs.

   Gland is under suction pressure only. Hence, it's less vulnerable to abrasive solids . . . less subject to packing troubles.

   Four adjusting screws close the worn clearances on the suction side of impeller. This adjustment moves the entire rotating assembly as a unit.

3. **Corrosion-abrasion resistant**—You may have the Morris Type R with its moving parts in any of various metal alloys, depending upon the kind of slurry you handle. Parts are quickly interchanged.

4. **Shell is interchangeable for right or left-hand rotation**—Permits 72 different combinations of suction and discharge nozzles.

5. **FREE TECHNICAL SERVICE**—Morris Engineers have been building pumps for more than 80 years. They will be glad to recommend the pump best suited to your needs. No charge or obligation.

FOR LESS TROUBLE...
LESS MAINTENANCE...
LESS LAY-UP TIME...
and LONGER HOURS OF CONTINUOUS OPERATION

Specify MORRIS TYPE R SLURRY PUMP

MORRIS MACHINE WORKS
Baldwinsville, N. Y.
Branch Offices in Principal Cities

MORRIS *Centrifugal Pumps*

tatives, James E. Bilderback, with headquarters in St. Louis. Mr. Bilderback was formerly associated with the operating department of the Moffat Coal Co., Sparta, Ill.

McNally-Pittsburg Mfg. Co., Pittsburg, Kan., has announced that R. C. Woohead, of its headquarters staff, and John Griffen, of its Pittsburgh, Pa., office, sailed July 15 for an intensive two-month tour of European coal-cleaning plants. They are expected to contact government and industry coal-preparation specialists in England, France, Belgium and the Netherlands.

Worthington Pump & Machinery Corp., Harrison, N. J., has elected Hobart C. Ramsey, executive vice president of the company since 1945, president, to succeed Clarence E. Searle, named vice chairman of the board of directors. Edwin J. Schwanhausser, vice president in charge of sales since 1945, succeeds Mr. Ramsey as executive vice president. John J. Summersby, formerly assistant vice president and general sales manager, has been elected vice president in charge of sales. Thomas J. Kehane, commercial vice president, Pacific Coast, since 1944, has been named assistant vice president and general sales manager, replacing Mr. Summersby. The company also has announced the expansion of its water-treating-equipment sales division and the transfer of that division to its Dunellen works at Dunellen, N. J.

Fairbanks, Morse & Co., Chicago, has appointed T. M. Robie, for the past several years manager of the company's diesel division, director of quality control for the firm's Beloit, Wis., works. Mr. Robie has been succeeded by J. W. Wright, formerly manager of the diesel engine sales department at the Kansas City branch.

American Car & Foundry Co., New York, has elected James F. Clark treasurer, to succeed Lester A. Blackford, who is retiring after 44 years of service. Henry V. Bootes, formerly assistant vice president, has been elected vice president in the company's sales department.

Ansul Chemical Co., Marinette, Wis., has announced that it is opening offices in Los Angeles, Fresno and Oakland to offer sales and service for its products in the Pacific Coast states formerly served by Snowden Chemical Co., Modesto, Calif. Robert E. Sexmith has been named West Coast manager, fire extinguisher division, with offices in Los Angeles.

Lincoln Engineering Co., St. Louis, Mo., has appointed Frank M. Goodman, formerly eastern sales manager, Skilsaw, Inc., sales promotion manager for its industrial division.

Baker Industrial Truck Division, Baker-Raulang Co., Cleveland, Ohio, has appointed John A. Matousek man-

Install it in 2 minutes . . . without tools

BOWDIL *Quick Action* ROPE SOCKET

THE BOWDIL Rope Socket was designed to make quick rope replacement without tools. It can be installed anywhere in two minutes. To install it, it is merely necessary to position the rope, place the cap in position and go to work. The tension on the rope tightens the wedge-shaped cap and the greater the tension the tighter it holds. To replace broken cable, it is only necessary to drive the cap back, releasing the grip on the rope. The heavy dove-tailed cap is easily removed with a few sharp blows of the hammer and has ample body for striking.

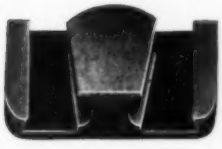
The Bowdil Rope Socket reduces the danger of mashed, scratched or punctured fingers, common causes of delays and infections. Special hook clamp on the eye end permits instant connection to any point on a long guide line without injury to the rope.

The offset eye design gives greater protection to the rope as the pull is straight out from the socket.

The Bowdil Rope Socket is forged from high-tensile alloy steel, heat treated for maximum strength, thus permitting the use of lighter, less-bulky parts.

Bowdil Rope Sockets are made to accommodate rope of various sizes from ¼" to 1". Inquiries for special application are welcomed.

Part No.	
704	. . . . ½" Rope Socket
706	. . . . ⅝" Rope Socket
707	. . . . ¾" Rope Socket
708	. . . . 1" Rope Socket



MADE BY THE MAKERS OF

THE COAL INDUSTRY'S STRONGEST CUTTER BAR

BOWDIL CANTON, OHIO

COAL CUTTING EQUIPMENT

SALES ENGINEERS IN — Whitesburg, Kentucky — West Frankfort, Illinois — Charleroi, Pennsylvania — Denver, Colorado — Big Stone Gap, Virginia — Danville, West Virginia — Canton, Ohio — Birmingham, Alabama — Helper, Utah — Kansas City, Missouri — Centerville, Iowa — Topeka, Kansas — New Castle, England — Alberta, Canada

MORE ECONOMICAL THAN ANY OTHER METHOD OF ENTRY CONSTRUCTION . . .

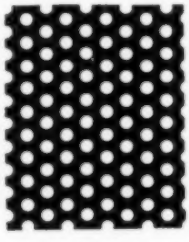
Anyone that can use a wrench can install COMMERCIAL Liner Plates. Less excavating is necessary, no timbering is required and entries can be completed in less time. Important, too, COMMERCIAL Plates can be moved and re-used!

COMMERCIAL LINER PLATES

THE *Commercial* SHEARING & STAMPING CO. YOUNGSTOWN 1, OHIO

Write for details. COMMERCIAL Liner Plates can be used in any opening or tunnel.

Hendrick Perforated Stainless Steel for classifying dewatering and desanding



Many coal preparation plants find Hendrick perforated stainless steel especially desirable for dewatering and desanding operations.

Such screens afford maximum resistance to abrasion . . . they are resistant to the corrosive action of acidulous mine water . . . the perforations remain clean and smooth, minimizing the danger of blinding . . . under normal conditions the screens remain smooth even with intermittent service.

The toughness of stainless steel permits screens to be made of lighter gauge than other materials, reducing wear on the operating machinery . . . and because of their long life shutdown time for screen replacement is definitely minimized.

Write for further information.

SEE OUR CATALOG IN SWEET'S

HENDRICK

Manufacturing Company

41 DUNDAFF STREET, CARBONDALE, PENNA.

Sales Offices In Principal Cities

Perforated Metals
Perforated Metal Screens
Wedge-Slot Screens
Mitco Open Steel Flooring
"Shur-Site" Treads and Armorgrid.

ager of manufacturing. E. H. Remde, formerly works manager, has been named to the newly created post of advisor to the president on engineering and manufacturing. H. A. Schultz, formerly superintendent, has been appointed manufacturing engineer, and I. L. Young, general superintendent.

Joseph T. Ryerson & Son, Inc., Chicago, has appointed J. L. McDermott manager of its Ryertex division, succeeding Kenneth T. MacGill, who is retiring after 32 years of service. Mr. McDermott was formerly western sales manager of the division. Formal opening of the company's recently completed new, larger plant and office facilities in Philadelphia, Pa., was marked by a two-day open house May 20-21, with about 2,800 customers and friends of the firm visiting the plant on Friday and employees and their families numbering about 500 being entertained by the management on Saturday. W. A. Redpath, manager of the plant, was host at the dinner and plant tour, and company officials were on hand to welcome guests.

Flexible Steel Lacing Co., Chicago, has announced that the live alligator on display as a prize in its booth at the A.M.C. Coal Convention has been awarded to Arthur S. Henry, owner and manager, Arthur S. Henry Coal Co., Uhlrichsville, Ohio.

Timken Roller Bearing Co., Canton, Ohio, this year is marking the 50th anniversary of its founding, during which time it has made some five billion tapered roller bearings ranging in weight from 2 oz to 9,068 lb. In addition to the manufacture of bearings, the company produces alloy steels and seamless tubing and Timken removable rock bits, operating plants in Canton, Columbus, Zanesville, Mt. Vernon, Wooster, Zoarville and Bucyrus, Ohio; Colorado Springs, Colo., and St. Thomas, Ont., Canada.

Linde Air Products Co., New York, has announced that its recently completed oxygen-distributing station and acetylene-producing plant at Fargo, N. D., has begun operations.

Hobart Bros., Troy, Ohio, has appointed Virginia Welding Co., 114-116 Virginia St. E., Charleston 1, W. Va., a distributor for the full line of Hobart welding equipment, accessories and electrodes, covering most of the counties in West Virginia.

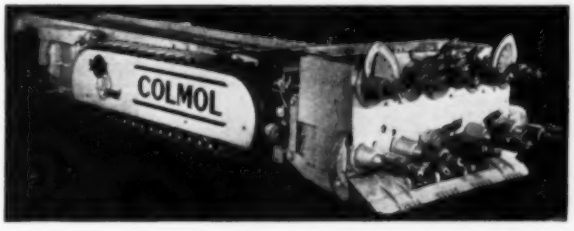
Caterpillar Tractor Co., Peoria, Ill., has appointed J. M. Davies, formerly associate director of research, director of research, succeeding C. G. A. Rosen, who will continue with the company in an advisory capacity. Dr. L. A. Blanc, assistant director of research, has been named to succeed Mr. Davies as associate director.

Klipfel Valves, Inc., a division of Hamilton-Thomas Corp., Hamilton, Ohio, has appointed Grant E. Scott Jr. assistant sales manager. Mr. Scott was previously associated with

JUST KEEPS ROLLING ALONG . . .

Something new has been added to mechanized mining . . . that's the COLMOL.

Look again . . . note how the coal rolls into that shuttle car. Note also the uniform size—minimum fines. You'll like the way this mobile one-process device advances into the coal, producing upward of 100 tons per man day.



(Patent Applied For)

Remember—the COLMOL takes the place of conventional cutting, drilling and loading machines—no shooting required. Wait for IT.

THE COLMOL COMPANY

912-24 North Fourth Street Columbus 16, Ohio

COLMOL is manufactured, sold and serviced by THE JEFFREY MANUFACTURING COMPANY, Columbus, Ohio

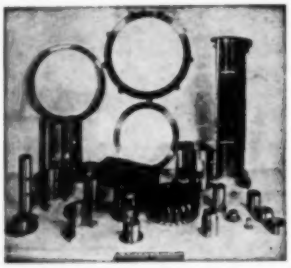
SAVE REAL MONEY

on high quality

AXLE BEARINGS
JOURNAL LINERS
BUSHINGS
WEARING PARTS

for General Electric, Sullivan, Goodman, Oldroyd, Jeffrey, Westinghouse and Joy equipment.

American Crucible methods, experience, know-how, and equipment spell big savings for you. Furthermore, today's invoices are reflecting declining production and metal costs. Your inquiry can pay you handsomely.



Each part produced from

PROMET BAR STOCK
Round, hexagon, square. Rough cast, semi-finished. Cored stock, all sizes (by ⅛" steps.) from 1½" minimum core to 12" O.D. and 13-inch lengths. Six grades of hardness.

PROMET
THE Engineered BRONZE

PROMET LEAD OR TIN BASE BABBITT

is of the specific formula best suited to the application.

Let us quote you on your requirements or write for free folders.

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Prompt deliveries can usually be made from stocks maintained at

BECKLEY, W. VA., The Universal Supply Company, 1207 S. Kanawha St. ..... Phone 7307
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Backed by 25 Years Experience with Storage Battery Locomotives

THE GREENSBURG "CRUISER"

Operators say— "20% MORE EFFICIENT than average Storage Battery Locomotives"

All Locomotives CUSTOM-BUILT to your requirements

FEATURES

2-motor drive; total 24 h.p.

Series parallel controller.

Extra long journal springs for better trackability, roadability.

Oil-tight, leakproof transmission. Use auto oil, renew once every 6 months.

Adjustable Timken Roller Bearings throughout.

Strong. Simple construction. Low maintenance cost.

MORE HAULING FOR LESS STORAGE BATTERY CAPACITY

THE GREENSBURG MACHINE CO.

Makers of Custom-Built Storage Battery Locomotives

101 STANTON ST., GREENSBURG, PA.

Wright Aeronautical Corp. as test engineer and with Allis-Chalmers Mfg. Co. as field and sales engineer.

Conlon-Moore Corp., Chicago, has appointed Winston Jones, former Conlon division sales manager, sales director for both the Conlon and Moore divisions in the mid-south territory of Illinois, Kentucky, Missouri and Tennessee.

Lincoln Electric Co., Cleveland, Ohio, has completed arrangements with The Austin Co. of Cleveland for the immediate construction of an $8,500,000 plant to be erected in Euclid, Ohio. The one-story manufacturing plant, which will contain over 850,000 sq ft of floor area on a 65-acre site, will be ready in 1950 for the transfer of all manufacturing operations from the company's present plant.

Industrial Safety Equipment Association, Inc., New York, has elected as president Lawence E. Dickson, president, Standard Safety Equipment Co., Chicago, for the second consecutive year. Charles H. Gallaway, sales manager, safety products division, American Optical Co., was elected vice president, succeeding Walter G. Legge. William J. Parker, of William J. Parker, Inc., New York, was elected secretary-treasurer.

Independent Pneumatic Tool Co., Aurora, Ill., has announced the completion of new factory-branch sales and service buildings in Chicago, New York, Pittsburgh and Toronto.

Link-Belt Co., Chicago, has announced that in expanding its facilities to serve customers, the following offices have been moved into larger quarters: the Cleveland office, headed by Paul V. Wheeler, district manager, now located at 314 Hanna Bldg.; the Huntington, W. Va., office, headed by David W. Stevens, at 1009 Fifth Ave.

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Trade Literature

Available Without Charge on Request to the Manufacturer

BUSWAYS—Trumbull Electric Mfg. Co., Plainville, Conn. Circular TEC-151 describes FVK Flex-A-Power plug-in busways, a flexible system for the distribution of light and power that can be dismantled, moved and reinstalled with 100% salvage of materials, along with information on an enclosed fusible safety switch, thermal circuit breaker, ground detector, neutralizer and capaciter.

CABLE VULCANIZERS — Mines Equipment Co., Dept. 2, 4235 Clayton Ave., St. Louis 10, Mo. Bulletin describes various models and sizes of electric-cable vulcanizers, offers suggestions on the use of vulcanizing compounds and lists molds for wide variety of cord and cable diameters.

CENTRIFUGAL PUMPS — Worthington Pump & Machinery Corp., Harrison, N. J. Bulletin W-395-B1 illustrates

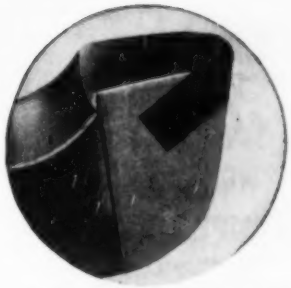
NOW! An improved CARBOLOY heavy-duty, coal cutter bit

- BOOSTS PRODUCTION
- REDUCES COSTS

HERE is a vastly improved, heavy-duty, coal cutter bit specifically designed for longer life, greater strength, faster sharpening.

The cutting edge of Carboloy Cemented Carbide — *the hardest metal made by man*—is inserted in the bit in such manner as to give maximum "hold". With this "insert" you get approximately 50% greater thickness at the cutting edge. You also get lower bit costs per ton of coal cut and less frequent bit changes.

Look into this cost-reducing Carboloy bit. It is designed for all cutting machines (including the "continuous" type) employing ½" by 1" bits. Send in the coupon for full information.



Cutaway view shows rigidly held Carboloy insert which has longer life, greater impact resistance, is easier to sharpen.

Get these 8 big advantages . . .

1. Less power consumed due to smaller point (design) radius.
2. Less carbide to grind when resharpening. (Less top and side area.) This means faster grinding and greater tip economy.
3. Less shank steel to grind when resharpening (yet adequate support for insert).
4. Shank level with Carboloy insert to permit free, unimpeded flow of coal (minimizes "bug dust").
5. Approximately 50% greater thickness of insert at cutting edge. (Greater strength.)
6. Maximum "Hold" of Carboloy insert provided by combination of braze and mechanical holding. Also greater protection for insert during bit changes
7. No shoulders. May be set to any gage size within range of use.
8. Forged alloy steel shank is hardened sufficiently to resist bending yet permits firm set screw clamping.

CARBOLOY COMPANY, INC.
11120 Eight Mile Street, Detroit 32, Mich.

CARBOLOY®
CEMENTED CARBIDE
The hardest metal made by man

Carboloy Company, Inc.
Detroit 32, Mich.

- ☐ Please send full information about your CC-2 Coal Cutter Bit.
- ☐ Without obligation we would like to have this bit demonstrated.

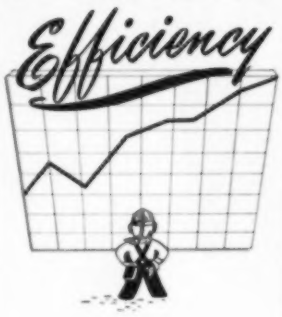
Name_____ Title_____

Company_____

Street Address_____

City_____ Zone_____ State_____

PRODUCTION



May be
INCREASED
by
effective
WORKMEN'S
COMPENSATION
INSURANCE

Increased production efficiency means coal mined at LESS cost per ton . . . and increased efficiency is often a direct result of our effective Workmen's Compensation Insurance that provides . . .

★ ENGINEERING SERVICE

To aid in reducing accidents and improving production methods.

★ PROMPT CLAIM SERVICE

That lessens litigations, provides ample claims payment and aids harmonious labor relations.

COAL OPERATORS CASUALTY COMPANY

THE SYMBOL OF SERVICE FOR COMMERCE AND INDUSTRY

COAL OPERATORS CASUALTY COMPANY

GREENSBURG, PA.

various models of Worthington stationary and portable self-priming centrifugal pumps, with pump and engine specifications and data.

CENTRIFUGAL-PUMP MAINTENANCE—Allis-Chalmers Mfg. Co., 968 S. 70th St., Milwaukee, Wis. Bulletin 08X6256A, "Handbook for Care of Centrifugal Pumps," is a revised manual on the care of all makes of centrifugal pumps, giving the how and why of pump construction and their effect on pump maintenance. The booklet tells how to figure head, provides tables to help determine total friction loss, outlines causes and cures for various troubles, and includes a maintenance timetable.

COAL PREPARATION—Link-Belt Co., 300 W. Pershing Rd., Chicago 9. Bulletin 2355, "Scientific Coal Preparation Methods and Equipment," contains installation views, flowsheet diagrams and other ideas for low-cost handling and better preparation of coal.

DRILL-AND-CUTTER-BIT REGRINDING—Firth Sterling Steel & Carbide Corp., Mining Division, McKeesport, Pa. Two new charts for regrinding coal-cutter and drill bits are printed on 11x15-in heavy cardboard, plastic laminated for easy cleaning and long service, and contain illustrated easily-understood regrinding instructions.

EARTHMOVING—Euclid Road Machinery Co., Cleveland 17, Ohio. Bulletin J-405 offers a number of illustraded case histories describing the Euclid loader and hauling units in operation. Construction and operating features of the loader, designed for high-speed loading of large hauling units, also are included.

ELECTRICAL CONNECTORS—Russell & Stoll Co., Inc., 125 Barclay St., New York 7. Bulletin EL49-103 features automatic locking Midget Ever-Lok plugs, receptacles and cord connectors.

ELECTRICAL FUSES—Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee 12, Wis. Condensed catalog describes in detail Trico fuses, fuse-clip clamps, test clamps, fuse pullers, lubrication devices, etc.

ELECTRIC CONTROLS—Ward Leonard Electric Co., Mt. Vernon, N. Y. Bulletin 100,000 covers the company's complete line of electric control devices for industrial and commercial control applications, including rheostats, resistors, relays, motor starters, contactors, control accessories and dimmers.

ELECTRIC MOTORS—Allis-Chalmers Mfg. Co., 968 S. 70th St., Milwaukee, Wis. Bulletin 51B6210B, "The Inside Story of Allis-Chalmers 'Safety-Circle' Motor Protection," describes the design and construction features of the "Safety-Circle" motor, available in various sizes and types and said to offer long life and low operating costs.

ELECTRIC MOTORS—Electric Machinery Mfg. Co., Minneapolis 13, Minn. E-M Synchronizer No. 28, features "The ABC of Large Induction Motors," a detailed discussion of the basic theory, operation, characteristics and applications, and control of large induction motors. Written by G. L. Oscarson, chief application engineer for the company, the study presents a comprehensive, practical, fact-filled review of squirrel-cage and wound-rotor motors.

ELECTRIC WIRE AND CABLE—General Cable Co., 420 Lexington Ave., New York 17. Bulletin covers in detail General Cable Super Service-S Neoprene-jacketed portable cords and cables for various types of mining services, with construction, application, specification and maintenance data included.

EMERGENCY BELT CONTROL—Mines Equipment Co., Dept. 2, 4235 Clayton Ave., St. Louis 10, Mo. Bulletin sheet covers new "Emergency

A WEDGE-WIRE ENGINEER IS READY TO HELP YOU:-

with THE SELECTION OF THE PROPER PREPARATION SCREEN

It doesn't cost a cent to obtain a WEDGE-WIRE recommendation for your plant. Our engineers will help you select the best screen for highest production at lowest cost. Our preparation screens are "tailor-made" and "Engineered to the job!"

The cross-section at left shows how KLEENZLOT screens operate on a non-clogging, non-blinding principle.

Wedge-Wire CORPORATION
5602 CLARK AVE. CLEVELAND 2, OHIO

MAKES GOOD USE . . .

. . . of "Pre-Filed" product data

Mr. W. C. Peternel, Superintendent of the Allegheny Contracting Co. of Pittsburgh, Pennsylvania, is responsible for selecting and *buying* machinery, equipment, supplies and service for his company.

He needs factual data to enable him to compare the relative advantages of various manufacturers' products and to decide which best fits his company needs. Such factual product information is always at his finger tips, for Mr. Peternel is a regular user of the McGRAW-HILL PRE-FILED MINING CATALOGS. In this up-to-date and complete source of manufacturers' products he usually finds everything he wants.

Here's what Mr. Peternel has to say: *"Find MINING CATALOGS useful for all types of mining equipment."*

This useful marketing tool is published by the McGRAW-HILL CATALOG SERVICE 330 West 42nd Street, New York 18, N. Y.

FOR SAFETY'S SAKE, SUPERIOR COUPLINGS

Drop Forged Links

Drop forged for strength, Superior Swivel and Single Link Couplings are built to stand the gaff. No welds to let go with resulting wrecks. Superior Couplings on your mine cars will prevent accidents and reduce haulage costs. Order Superior Couplings for your replacements and specify them on new equipment.

DROP FORGED SWIVEL COUPLINGS

PITTSBURGH KNIFE & FORGE CO.

1421 Reedsdale St., N.S.

Pittsburgh 12, Pa.

MERRICK WEIGHTOMETER

While material is smoothly moving along a conveyor, the MERRICK WEIGHTOMETER keeps a continuous and accurate record of weights. Total weight is available at a glance.

Applied to any size belt conveyor, either horizontal or inclined. The weightometer gives a simplified and dependable record of your production, without interrupting the flow of coal.

Write for Bulletin 375

MERRICK SCALE MFG. CO.

PASSAIC, N. J.

Belt Control System" for mining that automatically stops a conveyor system when it is hit by falling objects; can be manually operated at any point along the belt.

FIRE HOSE—B. F. Goodrich Co., Akron, Ohio. Catalog section details the construction methods and materials of the Goodrich fire hose line, with data on size, couplings and test pressures and weights for the various brands, and descriptions of gaskets, fittings and couplings used.

FIRST-AID AND CONTEST EQUIPMENT—Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa. Bulletin FA-103 covers the M. S. A. contest outfit, a completely equipped unit for first-aid training and contests; the M. S. A. emergency first-aid outfit; contest bandages; M. S. A. miner's first-aid cabinet; wood splints; Redi-Heat block; standard stretcher outfit; and various other M. S. A. first-aid cabinets and packs.

GEARMOTORS—Link-Belt Co., 307 N. Michigan Ave., Chicago 1. Bulletin 1815A covers the complete line of Link-Belt gearmotors, with a single selection table providing easier and more accurate selection of sizes of the various types.

MAGNETIC SEPARATORS — Eriez Mfg. Co., 874 E. 12th St., Erie Pa. Catalog 14 describes complete line of Eriez permanent non-electric magnetic separators and electronic metal detectors, and includes specifications, weights, sizes and strength comparisons for various chute and spout magnets, as well as capacity tables for permanent magnetic pulleys, drums, pneumatic-line assemblies, pipeline traps, road sweepers, ferrous fliters, floor sweepers and pipe rolls.

PORTABLE POWER TOOLS—Independent Pneumatic Tool Co., Aurora, Ill. Bulletin covers all models in new Thor "Silver Line" portable electric tools.

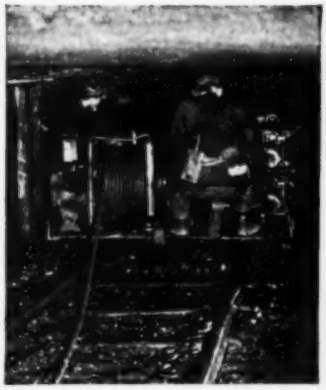
SAFETY TRUCK—Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa. Bulletin BH-5 illustrates and describes the advantages and equipment offered by the M. S. A. truck-mounted Mobile Safety Station for mine rescue, first-aid and instructional work.

SCREEN-CONVERSION DATA—McNally-Pittsburg Mfg. Corp., Pittsburg, Kan. Small pocket-size slide table contains condensed conversion data for punched screen plate, wedge-wire screen and screen-wire mesh, from 1 in to 400 M, with data correlated for inches, millimeters, U. S. wire mesh and Tyler wire mesh. Readings for the four measures are direct and also are given in decimal inches and microns.

STEEL MANUFACTURE—U. S. Steel Corp., 71 Broadway, New York 6. New 100-page illustrated book, entitled "Steel Making in America," prepared in response to requests received annually for up-to-date information about steel making, is being sent to science teachers, writers and editors, public libraries, high and junior high schools and junior colleges throughout the country. Describing in simple language the manufacture of steel in the United States from raw materials through finished steel products of every sort, the volume includes a brief history of the iron and steel industry from earliest days to the present time.

STUD DRIVER—Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa. Bulletin TA-17 describes and illustrates the construction and application of the M. S. A. Velocity Power driver for driving steel studs into steel, masonry or concrete with no outside power source required.

SUBSTATIONS — Clark Electronic Laboratories, Palm Springs, Calif. Bulletin 121 offers data on the Celab



BETTER THESE 7 WAYS:

Don't waste maintenance dollars on costly, unnecessary cable wear! Protect with tough, waterproof

RUBEROID INSULATING TAPE

1. Double grip. Both sides adhesive.
2. Great tensile strength.
3. Won't tear, ravel or pucker.
4. Abrasion resistant.
5. Acid and alkali proof.
6. Extra thick; one layer insulates.
7. Exceeds A.S.T.M. specifications by 300% in adhesiveness . . . by 26% in tensile strength . . . by 290% in dielectric strength!

The RUBEROID Co.

QUALITY BUILDING MATERIALS

500 Fifth Avenue, New York 18, N.Y.

Selenium dc power stations and oil-, air-and water-cooled rectifier units.

TROLLEY FITTINGS—Ohio Brass Co., Mansfield, Ohio. Portfolio covers construction and features of O-B "Smooth-Underrun" trolley fittings, including section insulator switch, feeder clamp, trolley frog, splicer and trolley clamp.

TROLLEY-POLE CONNECTORS — Mines Equipment Co., Dept. 2, 4235 Clayton Ave., St. Louis 10, Mo. Bulletin sheet lists sizes and illustrates new prefabricated trolley-pole-connector assemblies, consisting of a male and female plug with cable lengths made to customers' specifications and providing sectionalization through centrally located connectors for simplified replacement of damaged cable.

WATER HOSE—New York Belting & Packing Co., 1 Market St., Passaic, N. J. Catalog covering its line of industrial, commercial and general-purpose water hose includes data on the construction, maintenance and use of water and water suction hose.

WELDER—Birdsell Mfg. Co., Inc., P. O. Box 733, Los Altos, Calif. Bulletin describes features of 170-amp ac arc welder, with specifications and operator's instructions and units for obtaining effective results.

WELDING—Air Reduction Sales Co., 60 E. 42 St., New York 17. Reprint of an article entitled "Repairing Gray Iron Castings by Welding" contrasts three of the most common welding processes—oxyacetylene welding, electric-arc welding and carbon-arc welding—as applied to a forging-hammer anvil base and other cast parts of industrial equipment.

WELDING EQUIPMENT — Modern Engineering Co., Dept. 108, 3415 W. Pine Blvd., St. Louis 3, Mo. Catalog 140 covers every type of equipment necessary for acetylene and oxygen operations, with specific recommendations for its use.

WELDING SUPPLIES—Lincoln Electric Co., Cleveland 1, Ohio. Bulletin 467 describes Lincoln electrode holders, protective shields, welding cable and other products.

National Mine Service Completes New Beckley Building

THIS NEW MODERN HEADQUARTERS BUILDING at Beckley, W. Va., has recently been completed to house the executive offices of the National Mine Service Co. and the general offices of the company's Bemeco Division. The new administration building, which incorporates the latest design and construction features, was dictated by the company's growth in the past several years, according to Gordon MacVean, president. Since the start of the organization in 1946 with the Bemeco facilities, the company has established five additional divisions and warehouses located in various mining centers.

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The Cincinnati Duplex Chain with the Duplex Bit is recommended for maximum cutting efficiency. The block and connector are drop forged of high grade alloy steel, carefully heat treated and scientifically engineered to withstand hard usage.

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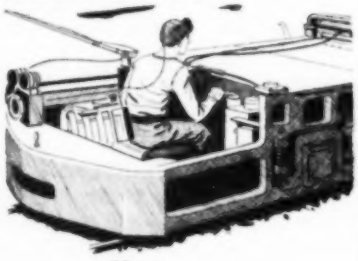

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Developed specially for use on small mine locomotives where space won't permit use of air brakes. Give full control of trips at all times, better average speeds with top safety, more accurate spotting of cars. Eliminate motor bucking to slow or stop . . . halt excessive repairs of pinions, broken axles and armature shafts, multiply brake shoe life, decrease wheel turning. Ask for reprint, reporting the results obtained in a Kentucky mine, and for Bulletin SP 9092.

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The Searchlight Section is at your service for bringing business needs or "opportunities" to the attention of men associated in executive, management, sales and responsible technical, engineering and operating capacities with the industry served by this McGraw-Hill publication.

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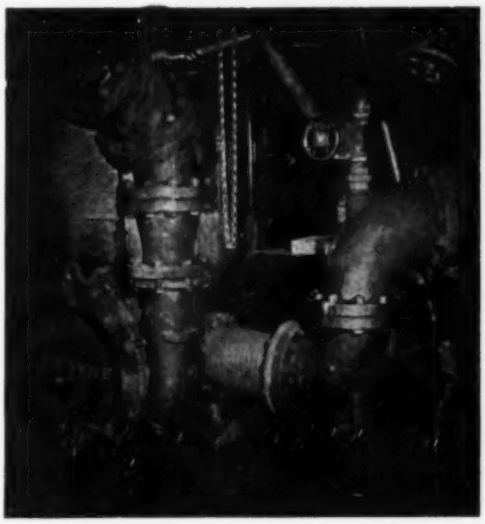
GOYNE PROCESS PUMPS



A Sand Pump is only a link in a chain in a coal washing plant, but it can be a strong link if it embodies the following features as does the Goyne.

1. Ease of inspection of all wearing parts. All internal portions are immediately accessible after removing only the rear head of the pump. No suction or discharge piping is disturbed.

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SELF-PRIMING Centrifugal Pumps

Non-Syphoning

Advanced features of design and operation of these new Deming Self-Priming Pumps set higher standards of performance for mine gathering, automatic pumping from pit, and other mine pump services.

Quick, positive priming is assured by large water chambers in casing and semi-enclosed, non-clogging impellers.

Repriming is automatic and dependable due to the non-siphoning feature which permits use of these pumps without check or foot valves (excepting where exceptionally long suction or discharge lines are encountered).

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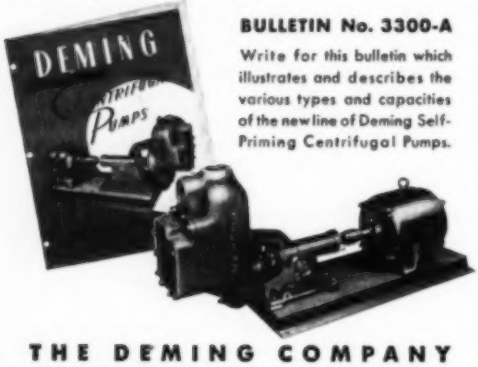

BULLETIN No. 3300-A

Write for this bulletin which illustrates and describes the various types and capacities of the new line of Deming Self-Priming Centrifugal Pumps.

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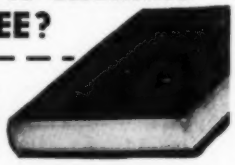

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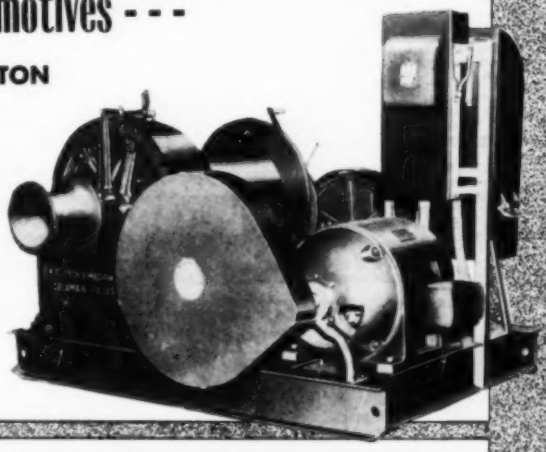
O.K. hoists are built to fit your specifications. We will gladly discuss any special problem—or supply you with information on the complete line of O.K. hoists, compressors or the portable elevator.



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A financially responsible organization specializing in buying, selling, repairing, rewinding and redesigning transformers only.

Experienced personnel assures you first class workmanship and complete satisfaction.

Every transformer guaranteed for one year

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"AMERICA'S USED TRANSFORMER CLEARING HOUSE"

MARIEMONT Since 1912 CINCINNATI 27, OHIO

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3—Goodman G-20 shaker conveyors with "E" type duckbills, 220 volt, 3 ph., 60 cy.

1—Goodman 97-C-30, entry conveyor belt, 1000 ft. centers complete with 30 hp, 220 volt, 3 ph., 60 cy. motor.

Kirk Coal Mining Company
Beech Creek, Ky.

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1946 2 yd. Manitowoc Stripping Shovel or Crane, Model 3500, D17000 engine.
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1944 Hardsogg Horiz. Drill, Mod. HHD188, Wisc. eng.
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Call Cincinnati, Ohio Valley 3161.
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We have recently closed our Hocking mine which is about four miles North of Athens, Ohio, and have the following for sale:

1 Joy 14 BU Loader
1 Joy 32-E Shuttle car
1 Joy elevator
6 8 BU Joy loaders
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6 MH-88 Jeffrey cable reel locomotives
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6 Goodman shortwalls.
6 Robins vibrators
6 Jeffrey 6A drills
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FOR SALE

1—200 H.P. High Pressure Boiler.
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1—Platform Truck Scale 15' long, 18,000# capacity.
Also few small H.P. Pumps

Drake Electric Service
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BRADFORD COAL COMPANY
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2—Ax-7 yd. Bucyrus-Monighan Red Arch Dragline Buckets with teeth and chains. A-1 condition.

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1—Single Drum Gasoline Hoist, direct connected to 2⅝ x 4¼ Wisc. Gas Engine.
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2—2RV-1 Ingersoll-Rand Motor Mounted.
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1—26" Hamilton Heavy Duty Drill Press, line-shaft drive.
1—Kennedy-Otto Drill Press, with 1 HP Gen. Elec. Vertical gearhead motor, 3 ph., 60 cy., 220/440 volts.

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1—Ingersoll-Rand, with drifter, all on pneumatic tires, used about 6 months.
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3—D-13000 Caterpillar Diesel Generators, 75 KW, 440 volts AC.
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150—Card Iron Works R.B. Pit Cars, 36" gauge.
1—Card Iron Works Rock Car, 90 Cu. Ft. Capacity.

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4—Connellsville Larry Cars, Trolley Operated, 6 Ton Capacity.

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2—7½ Ton Goodmans, 36" Gauge, 250 volts DC.

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2—Rheolaveur Launders, complete with steel supporting frame.
1—60" dia. Dividing Table, direct connected to 2 HP DC Motor.
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1—36" American Ring Type.

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1—14", 20' centers, new belt, V-belted to 1½ HP Motor.
1—24", 15' centers, Motorized.
1—30", 30' centers, new belt, on steel frame R.C. Drive to a 2 HP Gear Motor.
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1—Synchronous 145 H.P., 600 RPM Western Electric type ATA12-150 440 volt, can be rewound—direct connected exciter.

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1—500 KW G.E. Syn. 575 V. 900 RPM
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1—20 T JEFFREY 250 V. MH-77 48-36" Ga.
3—13 T JEFFREY 250 V. MH-2110 42-32" Ga.
1—13 T G.E. 250 V. MH-827 44-36" Ga.
1—10 T JEFFREY 250 V. MH-110 44-32" Ga.
1—8 T G.E. 250 V. HM-839 44-36" Ga.
1—8 T WEST. 250 V. ML-906-C 44-36" Ga.
1—6 T WEST. 250 V. ML-903-B 32-22" Ga.

LOCOMOTIVE MOTORS
2—JEFFREY 250 V. MH-77, Ball Bearing
2—G.E. 500 V. HM-820-A, Ball Bearing
2—WEST. 250 V. ML-908-C, Ball Bearing
2—WEST. 250 V. ML-907-C, Ball Bearing
2—WEST. 250 V. ML-906-C, Ball Bearing
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10 KW 125 v.—15 HP Master 440/220 NEW.

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75 HP. West. SK 152. 220 v. 1150 RPM.
60 KW West. SK 250 v. 1350 RPM Gen.
60 HP. West. CS 220/440/3/60 1200 RPM S. C.
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150 KW Triumph 250 v. 600 RPM Gen.
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1—100 KVA All. Ch. 2200 v.—220 v.
6—75 KVA G.E. 2400 v.—240/480 v.
3—50 KVA G.E. 2400 v.—240/480 v.

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20/25 Ton G.E. outside 4" armorplate frame, steel tires, 3HM, 824 BB Motor, 125 HP. each, 500 v., 42 or 44" Ga.

15 ton Jeff. MH110 Std. R.R. Gauge.
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8 ton Goodman 250 v. 42/44" Ga.
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6 ton West. 250 v. 304 Motors 36" Ga.
2 3 ton Goodman 30 B 250 v. 42" Ga. Gath.
2 4 ton Goodman, 250 v., 42" Ga. sgl. motor, gath.

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6 ton GE. Permissible BB Motors, 30/44" Ga.
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1—35BB Jef. Short Wall, A.C.
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3—Short Wall Machine trucks on Cats.

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We have approximately 100 machines on the floor, ranging in screening area sizes from 2'x5' to 5'x14' with 1 to 5 decks. Eccentric weight or positive throw eccentric shaft types.
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16" belt	19.00	30" belt	22.00
18" belt	20.00	36" belt	23.00
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1—18"x18" Link Belt Double Roll Crusher.
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1—Ottumwa Iron Works conical drum hoist, serial #2163, weight 25,000#, 1¼" rope, complete with remote control and hydraulic brakes direct connected to Western Electric 150 HP. motor, model 17815, type MT-564-10-150-730, form B, 3 phase, 60 cycle, 440 volts, slip ring, secondary volts 300, amps. 187, secondary amps, 182, speed full load 700, serial #4562312, continuous 60° C. Complete with controller and resistance.

1—Ottumwa Hoist #2561, drum diameter 48", face 36", face grooved for 1" rope, equipped with post brake 54" diameter, hand operated, single reduction cut spur gears, 19 teeth and 196 teeth, 1¼" pitch, 10" face, drum shaft 7" diameter, drum shaft bearing 7"x14", pinion shaft bearing 4½"x15" of the ring oiling type, direct connected to 100 HP. Westinghouse motor, type CW, 220 volts, 3 phase, 60 cycle, 360.8 amps, 580 RPM. #2394853.

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1—8 ton Goodman ball bearing locomotive, 42" gauge, type 32 AO 47.
1—4 ton Whitcomb Battery locomotive, 36" gauge.
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Truckload and car lots of good second hand 16, 20 and 25 lb. rails.
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4—CLE5 AC, 3 phase, 60 cycle, 220 volt, Sullivan longwall mining machines.

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1—Jeffrey Shortwall Mining Machine, 35 BH, AC, 6' cutter bar complete with tip turn truck, cable and reel.

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1—Stephens Adamson Coal Cleaner.
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1	350	G. E.	1200	600
1	300	G. E.	1200	275
3	175	G. E. or West. 3 ph. 60 cycle	1200	275
1	125	G. E.	1200	275
1	75	G. E.	1800	275

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Complete Stock A.C. Motors—New and Rebuilt Up to 500 H.P.—Sq. Cage, Slip Ring, Synch.

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36"	6	1/8" — 1/16"	20"	4	1/8" — 1/32"
30"	6	1/8" — 1/16"	18"	4	1/8" — 1/32"
30"	5	1/8" — 1/16"	16"	4	1/8" — 1/32"
26"	5	1/8" — 1/32"	14"	4	1/16" — 1/32"
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	16"	6	10"	5	5"	5
	14"	6	8"	6	4"	5
	12"	6	8"	5	4"	4
	12"	5	6"	6	3"	4

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1"	25 "	6.25		50 "	15.00
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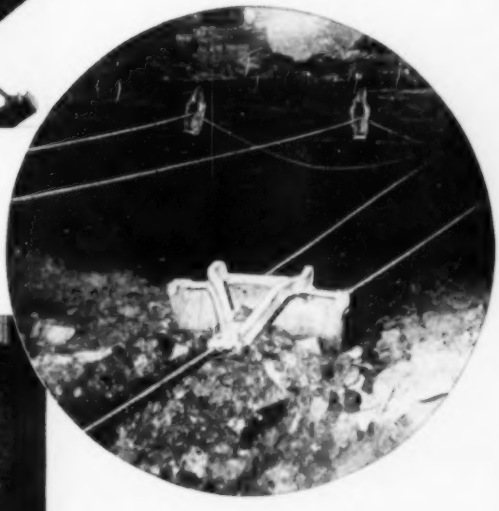

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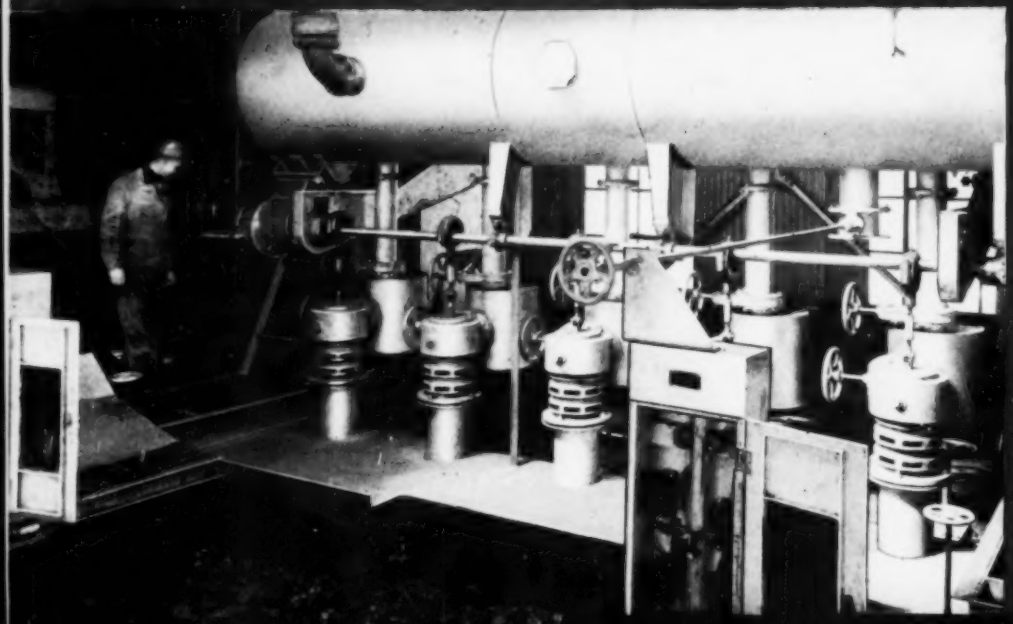

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Right: Link-Belt tipple and washery at Pond Creek Pocahontas Co., Bartley, W. Va.

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